



SCHOOL DESIGN REQUIREMENTS MANUAL

DEPARTMENT OF
EDUCATION
AND CULTURE

DEPARTMENT OF
TRANSPORTATION
AND PUBLIC WORKS

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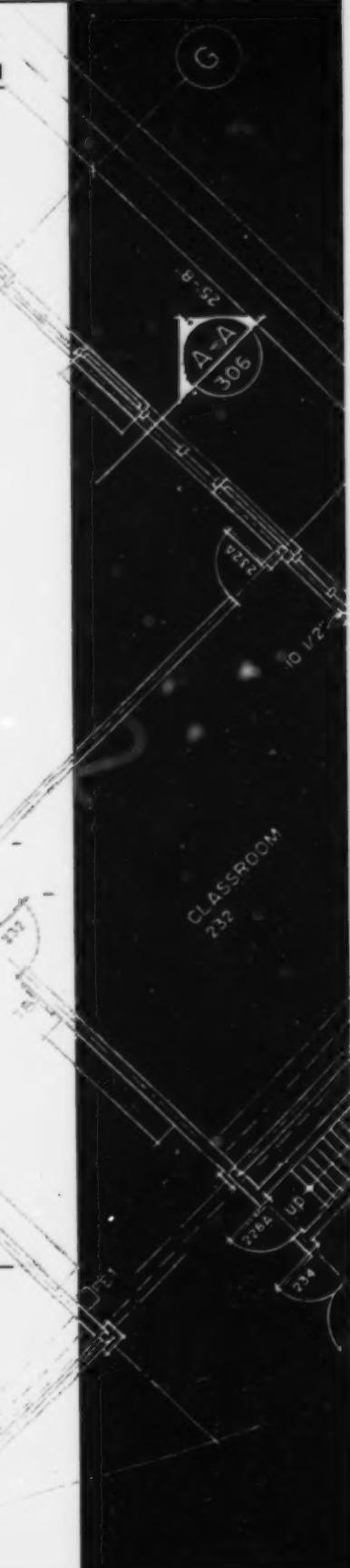
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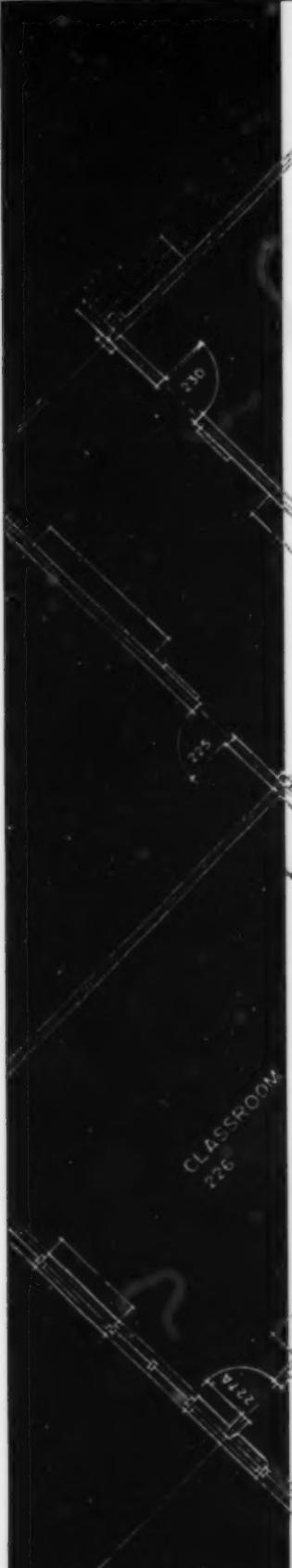
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A Appendix

- A APPPLICABLE LEGISLATION

Preface

This School Design Requirements Manual was developed to identify the minimum acceptable design and construction standards for schools to be financed, designed, built and operated by the private sector in Nova Scotia.

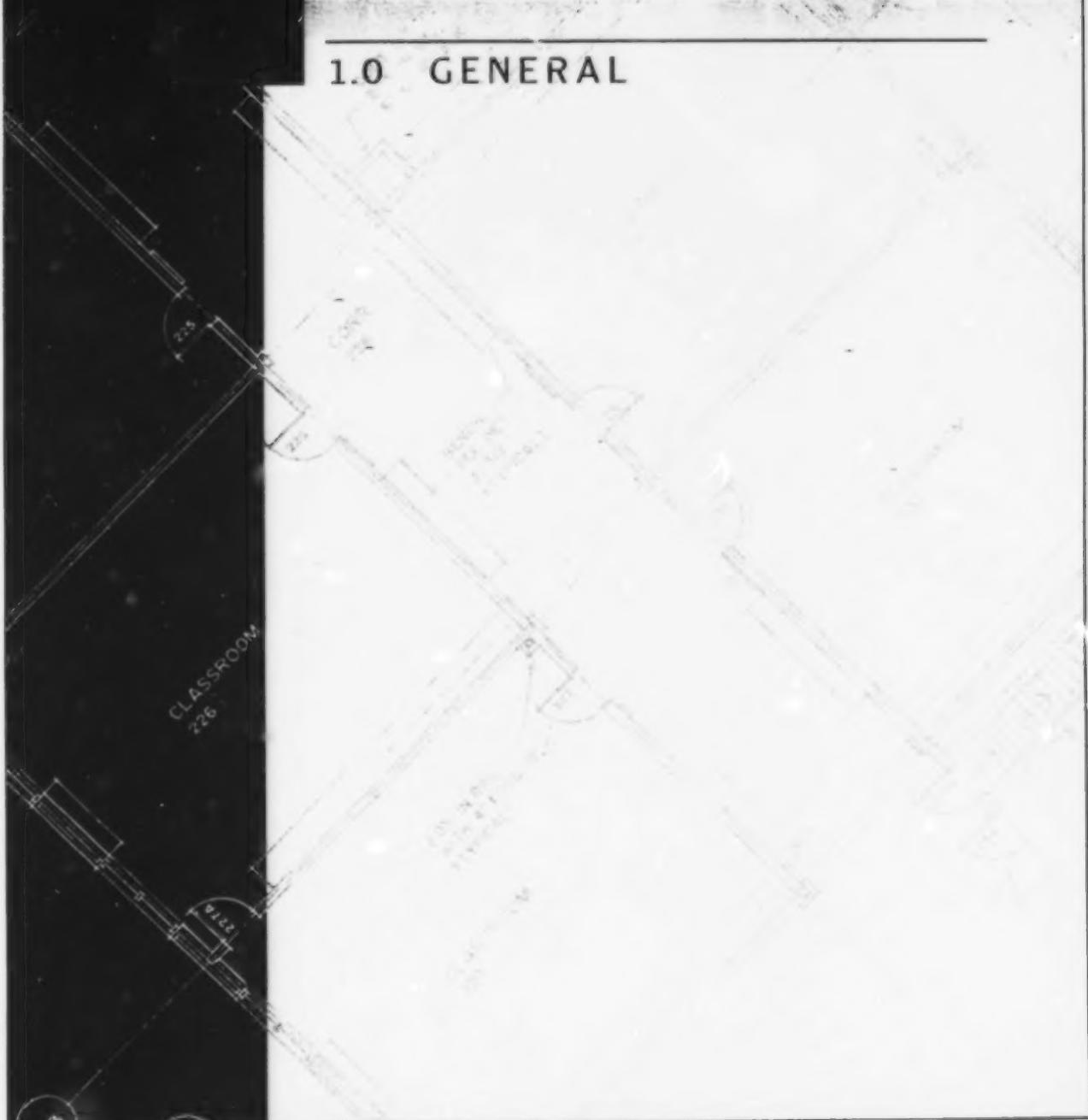
The Manual was generated by a committee of representatives from the Nova Scotia Department of Education and Culture and the Nova Scotia Department of Transportation and Public Works with input from Architects and Engineers from the private sector. It is intended that the Manual (produced in May of 1998) will be updated periodically.

This Manual is to be read in conjunction with a specific School Program which will be issued for each individual school. The specific school program will define which and how many of the spaces described in the Manual will be incorporated in an individual school, along with other information applicable specifically to that school.

The organization of the Manual flows from the general to the specific. Section one introduces levels of schooling; the role of the school in the community, and technology in the School. Sections two and three review the site and the building design considerations. Section four identifies general performance criteria. Sections five, six and seven consist of outline specification requirements for architectural, mechanical and electrical components. Section eight is a compilation of built-in equipment.



1.0 GENERAL



1.0 GENERAL

INTRODUCTION

In all levels of schooling, the design must provide flexibility of learning spaces. The school will be characterized by variety in size of learning spaces recognizing that learners, teachers, and others engaged in learning experiences will work in groups of different sizes. Spaces are needed for individuals, small groups, groups of typical class size, large groups of 60 to 100 learners, and for the entire school population. The design of schools must accommodate learning experiences in settings such as seminars, small project groups, large performances or presentations, laboratories, as well as in-classroom and community based settings.

Current pedagogy reflects a philosophy of student-centred learning. The teacher plays a range of roles in directing, managing, facilitating, and supporting student learning. These roles require the teacher to move freely about the classroom with easy access to all learning spaces. While teachers need their own working space within classrooms, the notion of a designated teacher space at the front of the room is outdated. Indeed, classrooms should not be designed with a discernible front and back.

To accommodate learners' diverse learning styles and preferences, each classroom should allow optimal opportunity for the use of a range of communication modes and activities.

The school program requires a variety of grouping arrangements to allow interactive and cooperative learning. It is essential that classrooms are large enough and furnished appropriately to allow learners to shift from individual activity to triad and small group learning experiences. In mathematics classrooms, for example, learners will be required to use manipulatives for independent and small group learning experiences.

Students require opportunities to teach and learn from their peers. Mentoring and peer tutoring programs have been demonstrated as valuable in improving student achievement. One-on-one, side-by-side working spaces, and small group meeting spaces are required for such experiences.

School design needs to reflect the importance of technology in all subject areas. Technology is integral to curriculum, instruction, assessment, the accommodation of different learning styles, and increasing individualization of the learning process. It is important, therefore, that classroom size for all subject areas accommodate both the maximum number of students anticipated and the technology they will be using to learn.

Learners need opportunities to express themselves through the arts and to respond to various forms of the arts. All learners are required to include arts education in their high school program and therefore need education in the arts through all levels of schooling. In

additional to visual arts, music, drama, and dance, arts education includes programming options such as design, film and video production, and multimedia. The facility should include production, performance, and exhibition facilities for learning in the arts such as display/gallery spaces accessible with ease to all learners and other members of the schools' community.

Schools collaborate with other community organizations and agencies (such as health, community services and justice) in the provision of a range of services to students. To facilitate the delivery of such services schools need office/consultation spaces which are easily accessible to both students and service providers yet offer some privacy.

Comprehensive guidance and counselling services require office space, secure storage capability for confidential records, and consultation facilities which afford privacy. In addition an easily accessible and "student-friendly" information centre is required. This information centre will provide access to both display and take-away materials. Some schools also provide career information services to the wider community.

1.1 LEVELS OF SCHOOLING

The public school program is described in terms of three levels of schooling: Elementary, (P-6), Junior High (7-9), and Senior High (10-12). However, throughout the province there are various configurations of grade levels within a school building or within administrative units. Most common of these configurations include grades P-6, P-8, P-9, 6-8, 7-12, 9-12 and 10-12.

As new schools are built, there is a growing trend towards configuring schools for early adolescent learners as grades 6-8, 7-9, or grades 5-8. New high schools may house grades 10-12, but in increasing numbers may include grade 9 learners as well.

This document will organize information in three categories: Elementary, Junior High/Middle and High School. Individual school programs will reflect the specific nature of the grade levels included in the school.

1.1.1 ELEMENTARY SCHOOL

Elementary school is the child's introduction to public school. The design of the school must recognize the needs of children as they make this significant transition from smaller environments of home, day care, pre-school, and other community settings to the larger public school setting. The design will facilitate the children's comfort and self-confidence within the building and on the grounds. Hallways will be short. Common learning, dining, and performance spaces will be centrally located and easily accessible from classrooms. Administration and support services will be accessible and inviting to the learners.

The elementary school will generally be designed for a maximum of 500 learners.

1.1.2 JUNIOR HIGH/MIDDLE SCHOOL

The school building for early adolescent learners will provide structures that encourage flexible grouping of learners, flexible schedules and variety in learning experiences which will include classroom learning as well as many small group settings. Flexible areas will facilitate interdisciplinary learning and teaching. The junior high/middle level school building will feature a number of gathering spaces that may be used for physical activity, performances, recreation, socializing and community meetings.

The building design must recognize the growing independence of the learners while providing spaces for a variety of interactions between the learners and school personnel. There will be spaces for small group meetings, for mentoring, counselling, and advising learners. Teachers will require a variety of meeting and working spaces as team planning and teaching are encouraged at these grade levels.

The junior high/middle level school will generally be designed for a maximum of 700 learners.

1.1.3 HIGH SCHOOL

The senior high program involves a range of common, shared learning experiences in particular for grade 10 learners. Spaces are required to accommodate the need for a number of classes to participate in presentations, assemblies, expositions, and other large-scale events. Grades 11 and 12 are specialization years in which programming offers a range of options and requires significant opportunities for individual, independent, self-directed learning in laboratories, the library, and other learning, resource, and study centres. All senior high learners require assembly areas in a variety of sizes and locations for learning and for socializing.

High schools will generally be designed for 1000 students.

1.2 ROLE OF THE SCHOOL IN THE COMMUNITY

The school is a valuable community resource providing gathering spaces for both large and small community groups. Consideration will be given in the design process to community use of school facilities.

The primary function of the school is the education of learners in the Nova Scotia public school program. Student success is influenced by the level of involvement of parents and

other community members in school life and the educational program. Schools at all levels must be welcoming to parents and other community members.

While it is recognized that parent and community involvement is an important factor in student success, the school also has a role to play in the life of the community. Schools should be viewed as centres of life-long learning that contribute to meeting the continuing education needs of the community.

1.3 TECHNOLOGY

Technology in public schools is selected to enhance and extend learning. Technology includes information technology, such as multimedia computers, data information systems and the Internet, as well as audio and video recording, still images and calculators. Technology education also includes modules which introduce students to design, production, manufacturing and publishing. In most grade levels and subjects, students will learn about technology by using technology to solve curriculum related activities. To accomplish the vision for the integration of information technologies within the public school programs all students and teachers must have access on an on-going basis to appropriate technologies within the classroom and school library or media centre to support their work in all French and English curriculum programs. In addition, some learners and teachers will require access to adaptive and assistive technology to provide support and access to the curriculum.

The use of technologies within education improves learning when those technologies are immediately accessible, flexible, responsive, empowering and integrated within the public school programs. Classroom computers will be part of a school-based LAN which is connected to regional, provincial and global information networks. Emphasis is on learners' use of productivity software, communications software, data collection probes and software information technologies to research and to communicate their understanding in verbal, visual and multimedia forms.

In elementary schools, no special rooms are required for technology. Flexible spaces are required where small groups of students or community can access technology. The overall focus is on integration of technology within curriculum.

In the junior high school there could be temporary space for whole class instruction in information technology, but the overall focus continues to be on integration of technology within curriculum.

At senior high school, the focus continues to be on integration of technology within curriculum, but some students may elect to study technology in depth through technology education, business education, and computer related studies. Many high schools will have a facility for distance education which may include audio-graphics or video conferencing as a means of delivering aspects of the public school program.



2.0 SITE DESIGN PLANNING



2.0 SITE DESIGN PLANNING

INTRODUCTION

The primary considerations for site planning are environmental issues such as: preservation of natural features, land use, grading, storm water run-off servicing and site zoning issues. These include traffic control and a general understanding of the principal site areas such as play fields, playgrounds, outdoor performance areas and outdoor learning areas.

Two additional areas of paramount importance are:

- Universal Design/Barrier-Free Access - the entire site must be barrier-free. There are no exceptions.
- Future Expansion - provision must be made to expand the school building.

2.1 SITE OVERVIEW

2.1.1 ENVIRONMENTAL ISSUES

The best site designs will respect and retain as many natural site features as possible. Existing vegetation especially forest areas or specimen trees must be retained to the largest extent possible. Existing changes in grade should be accommodated and used to advantage. Existing water courses cannot be diverted or changed without approval from the Department of Environment.

The best design solution will minimize the impact of the development on the site itself and will have no impact on any of the neighbouring properties.

Balanced design seeks to resolve all the water supply, rain water run-off and sewage disposal issues within the boundaries of the site.

The accumulation of rainwater on the roof, run-off from driveways, parking lots, landscaped areas, etc must be carefully addressed and handled in a manner that does not adversely affect any neighbouring sites or existing water courses. A balanced design approach will deal with all the rain water collected on the site through holding ponds, existing wetland, or other storm water retention systems.

Sites not serviced by water and sewer provide another opportunity for balanced site design. If a well is required, it must be drilled and tested prior to commencing school construction and preferably prior to commencing the design process. A site without water is not a school site at all. Chemicals such as arsenic in a well could rule out the use of a site for a school. Detailed chemical analysis and seventy two

hour flow tests must be performed on all wells.

On site sewage disposal requires special engineering consultation. A contour sewage disposal bed, the usual solution, can be an important part of a balanced site design.

2.1.2 AIR QUALITY ISSUES - The indoor air quality can never be much better than the air outside the building. The site selection process should avoid sites with any of the following:

- large boggy areas
- highway noise
- noise from industrial neighbours
- smoke or pollution from neighbouring properties

The planning of the site must address these issues should they be apparent and unavoidable. Other air quality issues related to site planning are:

- relative position of the buildings own chimney's and air intake louvres, and the direction prevailing winds
- location of buses, trucks and cars relative to air intake louvres
- location of neighbours relative to both intake and exhaust louvres
- air intake louvres cannot be near exhaust air louvres or cross contamination can occur

2.1.3 UTILITIES - Planning for power, communications, water and sewer will be critical. Three phase power is a requirement. In many rural sites only single phase power can be found locally. This must be upgraded to 3 phase.

An underground power service is a safety requirement for all schools. The power cables from the pad mounted transformer to the building will always be underground. The service from the street to the pad mounted transformer should also be underground. Where this distance is excessive, the power line can be brought to the transformer via poles provided the overhead cables do not cross the schools driveways, sidewalks, playgrounds, or sports fields.

Site lighting will be by building mounted lighting where possible and by free-standing lamp standards as required. For security reasons, the following illumination is required.

- Sidewalks - 1 foot candle
- Parking lots - 1 foot candle
- Landscaped areas - 2 foot candles extending 20' away from the building. In

all cases lights must be focused downward to minimize upward light diffusion.

Communication lines, (telephone and cable tv) should also be underground. If the distance is excessive, the power poles may also be used for communications lines. The final run into the building must be underground.

Water Service - A municipal service may be available but may not have sufficient pressure for the school. If this is the case, special measures must be taken to provide adequate pressure and volume of water for the sprinkler system as well as the school's domestic water system.

- 2.1.4 LANDSCAPING - Local distinctiveness in planting should be taken into consideration so that local character is maintained wherever possible. Tree and shrub planting should aim to create a strong landscape structure which defines spaces, directs views and provides vistas. All opportunities should be taken for the planting to offer shelter and shade, the filtering of dust and noise, varied habitats and green corridors. The planting design should reflect the inherent character of the site and objective of diverse educational use.

There should be awareness of the intensity and robustness of subsequent use and the general desire of low maintenance. Care should be exercised with the width, shape and edge details for shrub borders so that they thrive amid intense use. Planting appropriate shrubs next to pathways is important as is planting trees at appropriate distances from buildings, boundaries, roads, paths, overhead services, underground services, etc.

A variety of plants will be needed to provide ecological diversity, richness and cover. Planting should provide nectar, seed heads, scent, colour, texture, and variety and should be attractive to birds, butterflies and other insects and animals. It should include plants that learners will like to touch, smell, draw and pick; trees and hedges to provide shelter and/or screening to reduce noise and disguise fencing, and to provide blossom, fruits, nuts, colour, texture, tree shape and variety, shape and patterns in leaf and bark. The planting should provide green edges, green corners, green corridors, greenery and twigs for picking.

Wherever possible, incidental seating, such as low stone walls and amphi-theatres should be used as part of the total seating. Sheltered outdoor space should be provided on the site for a whole class to be able to sit together on grass or tiered seating and there should be several areas for small groups of learners to sit and work together.

2.2 SITE ZONING

- 2.2.1 **GENERAL** - The site must accommodate areas for play fields, play areas, outdoor learning areas, outdoor performance areas, the building, and various types of traffic.

The play field as the largest single element will usually have the most influence on the zoning of the site. The location of the school building relative to the street requires special consideration. An elementary school should be away from the street, to give a sense of security and to keep young learners away from traffic. This must be balanced by the need to give the building a significant location relative to the street to reflect the importance of the school to the community. A high school will have a closer and more direct relationship to the street.

Play areas for elementary schools must be easily supervised from the school building. Play areas must be barrier-free, sheltered by landscaping and south facing where possible. Outdoor paved courts are an integral part of junior/middle schools.

- 2.2.2 **SEPARATION OF TRAFFIC** - A key principle of site planning for schools is separation of traffic. Pedestrian sidewalks must be completely separate from all driveways. Within the driveway system, school busses require a dedicated driveway so that learners can board or leave a bus in complete safety, with no other traffic in the area. Parents dropping off learners will not be permitted to use the school bus driveway.

School Buses - will take up the most space and will dominate the road layout. The number of buses to be accommodated will be given in the specific school program. The full number of buses must be able to line up single file in front of or beside the school. School bus traffic must be kept separate from all other traffic and students must be able to walk or be transported directly from each bus to the school on a sidewalk without crossing any other vehicular traffic. The school bus area must be visible from the administration area.

Buses cannot be permitted to back up. A continuous school bus loop or a school bus turning circle must be provided on site. Turning radii must be suitable for buses. The minimum radius is 50 feet.

Parent Drop-off of Students - must be accommodated by providing a driveway close to the front door of the school. A continuous loop or a turning circle is required so that cars will not be required to back up.

Sidewalks must connect the front door of the school to the street without crossing either the main school driveway or the school bus driveway. Bicycle racks will be provided close to the front door.

2.2.3 SITE RELATIONSHIPS

Playing Fields must be located near the gymnasium. A barrier free sidewalk must connect the gymnasium to the playing fields, preferably without crossing any of the major driveways. The outdoor storage room of the school will be located as close as possible to the playing field.

Parking is required for the playing field. Playing field parking can be provided by making double use of the staff or student parking lots.

Playing Areas will be located close to the classrooms they serve. Middle and junior high students will have a separate play area featuring for example, basketball standards. Access to the play areas and accessories must be barrier free and as direct as possible. Play areas, particularly for the youngest children should be visible from the Principal's office wherever possible.

Visitors to the school will generally arrive by car. A visitor parking lot must be close to the front door and be clearly recognizable on approaching the school. One visitor parking place for every four classrooms will be required. At least two of these must be barrier-free.

Staff Access must be addressed with a staff parking lot near either a secondary entrance or the main entrance. Parking places will be required for each classroom unless more spaces are required by the local municipal by-laws.

Student Car Parking will be a requirement for senior high schools where three additional student places per classroom will be required.

Barrier-free Parking must be considered in all of these categories. Such parking places must be near an appropriate entrance. Cross slopes are not to exceed 2%.

Service Vehicles will require a separate driveway from the bus traffic. Access by truck is required to the kitchen, boiler room, oil tank and recycling room. Material deliveries must also be considered for special areas such as tech ed, music, drama, performances areas and the gymnasium. Trucks must be kept well away from areas where students circulate or congregate and from air intake louvres.

A suitably screened area is required for garbage containers. Garbage containers require a concrete pad and cannot be located near air intake louvres.

Emergency Vehicle access, particularly fire truck access must be considered. A ring road around the school is the best solution. Control gates will be required to prevent unauthorized traffic from racing around the school. Alternate solutions must address the turning radius of the fire trucks. In rural areas the local fire chief must be consulted for approval of fire truck access routes.

- 2.3 SPORTS PLAYING FIELDS** - All schools require a sports field. Elementary and Junior High/Middle schools will have a combination soccer/baseball field. This field will be regulation size. High schools will have a regulation size soccer field plus a baseball diamond where space permits. The individual school program will be more specific.

Soccer Field - Regulation size is 220' x 350' which includes a 10' run-off strip on all four sides. The preferred orientation is north west/south east for the long axis.

A baseball play surface should be provided. The preferred orientation is north south with the batter looking south from home plate. Backstops should not interfere with activity on the soccer field.

Space for a future running track should be provided where possible, usually circling the soccer field.

Drainage is critical for a sports field. If the ground is dry, crowning the field will be sufficient provided a drainage path is provided for the run-off. In damp or low areas, drain tile and granular fill will be required under the field. A landscape architect should be consulted.

- 2.4 PLAY AREAS** - A playground is required for elementary schools, preferably on the south side of the school. Play areas need to be barrier-free sheltered and south facing. Positive drainage away from the playground is a requirement.

Playground equipment must be provided, designed for the appropriate ages of the learner. The playground must be barrier free, and sized to suit the population of the school. Base material must be suitable for wheelchairs. Design play areas to meet CAN/CSA Z614-98.

Middle schools and high schools will require a hard surfaced paved area. Specific use will be determined by the school program.

- 2.5 **OUTDOOR LEARNING AREAS** - Outdoor learning areas should be provided wherever possible. These areas must be accessible to all learners. A gardening area, an existing forest, brook or pond or an amphi-theatre in a natural bowl can all be utilized as outdoor learning/performance areas.
- 2.6 **PERMITS** - Permits for site development are required from:
- Nova Scotia Department of Environment
 - Nova Scotia Department of Transportation and Public Works
 - Local Fire Fighting Authorities
 - Authorities having jurisdiction

3.0 BUILDING DESIGN PLANNING

3.1 BUILDING OVERVIEW

INTRODUCTION

Elementary Schools: The child's first introduction to public school should be warm, inviting and friendly. The building should be one storey in height. Large schools must be subdivided into smaller more intimate groups of spaces to reduce the scale to a level appropriate to the beginning student. Corridors must be short, and the layout straight forward and easily comprehended.

Learning spaces will be grouped together in clusters in order to create families of learners within the school.

Middle/Junior High Schools: These schools should be more in character with elementary schools than senior high schools. Although two storey designs are acceptable, short corridors are still a requirement. Two storey designs require an entrance lobby which clearly introduces both stories. The main stairway must be clearly evident. Community offices and daycare centres may be introduced.

Senior High Schools can be up to three stories. Room groupings are more likely to be by discipline. Storage rooms will be required for each discipline, and specialized labs and fine arts rooms will now be required. Gallery and display spaces should be provided in areas other than transit areas. The library will be designed to accommodate individual study and research. Community office and daycare centres may be introduced as schools move toward increased community involvement and support.

For all schools, flexibility in space utilization is required to offer opportunities for individual, small group and large group work.

3.1.1 COMMUNITY USE

In addition to functioning as a school, the building will be used by the community during and after school hours. Schools may have additional community spaces incorporated into the school and paid for by the community (see specific school program). In all cases the school must be architecturally zoned to allow public access to specific areas only. These spaces at a minimum are the gym, cafeteria, library and information technology classroom. Other areas may also require public access (see specific school program).

The building design must allow for public access to these areas while providing security for all other areas. Public access includes the following:

1. Access to public barrier-free washrooms.

2. Access to exits as required by code.
3. Access to an elevator if community use spaces are on a floor level other than the main entry level.

The ventilation systems must also be zoned to match the architectural zoning so that specific public areas can be ventilated without ventilating large blocks of unoccupied space. The security system requires similar zoning.

The school facility must be inviting to a variety of cultures and include cultural representation of the community.

3.1.2 NATURAL LIGHT

Daylight is critical to providing human comfort and to providing spaces conducive to learning. Operating windows to the exterior shall be provided in all areas to be occupied by students and staff, with the exception of the gymnasium and cafeteria kitchen. Windows in any room shall provide a minimum of 12% of the floor area in glazing. Within this 12%, operating windows shall be provided in an amount not less than 5% of the floor area of the room. Learning areas must be able to be darkened to allow use of projection screens, etc.

3.1.3 INCLUSION/UNIVERSAL DESIGN/ACCESSIBILITY

The school shall be able to be approached, entered and used by all persons. The main entrance shall be at grade without stairs or ramps. Secondary entrances shall be at grade without stairs or ramps where possible.

Schools of more than one storey shall be provided with at least one full size elevator. Whenever sinks, showers, or similar fixtures are provided in a room, at least one of each shall be barrier free.

3.1.4 ENVIRONMENTAL

The environmental conditions within the building will be affected by a variety of conditions all of which must be considered early in the planning process:

- Off Site: sources of noise, smoke, exhaust fumes, etc. must be considered early in the site selection process as well as in the overall site planning process. In rural areas insect screens on windows are a requirement.
- On Site External Factors: both the building layout and site planning have environmental considerations. The location of the air intake louvres for example must be carefully considered relative to prevailing winds; car,

truck and bus exhausts; chimneys and building exhaust louvres.

Internal Factors: Noisy areas must be separated from quiet areas. Boiler rooms must be remote from academic wings and separated from the remainder of the school by a vestibule and a corridor. Air handling rooms and rooms containing electrical transformers cannot be above or adjacent to learning areas.

Finishes: must be selected to minimize off gassing to the air in the school. All finishes must be non-toxic. This applies to furniture finishes as well as building finishes. Natural organic products are preferable to manufactured petroleum based products. Paints and adhesives must be specified to be low VOC and have "Ecologo" labels to meet emission and toxicity standards published by Environment Canada and CSA. The total concentration of airborne volatile organic compounds (TVOC) cannot exceed 5.0 milligrams per cubic meter of air, and, within that concentration, no single volatile organic compound shall exceed 10% of the total airborne volatile organic compounds.

3.1.5 SELECTION OF FINISHES

All finishes should be welcoming and attractive and environmentally safe with special emphasis on ease of maintenance and durability. Hard floor finishes for example are easier to keep clean and mould free than softer materials. Vinyl wall fabrics must be avoided as the adhesive provides an area which will support the growth of mould under certain environmental conditions.

- Carpet is not appropriate for classrooms, corridors and other high use areas. Carpet may be considered for administration areas and libraries.
- Hard tile such as quarry tile is ideal for high traffic areas and is a requirement for lobbies and areas near entry and exit doors. Hard tile is highly recommended for the main building corridors as it is extremely durable and easy to maintain. Quarry tile or ceramic tile is required in all washrooms and shower rooms.
- Vinyl composite tile in 12" x 12" squares or sheet flooring such as linoleum or sheet vinyl are appropriate for learning areas, secondary corridors, etc.
- In most cases the durability of wall finishes will control the selection. Corridor walls exposed to traffic for example, must be either concrete block or abuse resistant drywall. Standard drywall is acceptable only in areas protected by lockers or other equipment.

- In learning areas concrete block or abuse resistant drywall is required for all exposed walls. Areas behind cabinets, communication boards, tack boards, etc. may be standard drywall.
- Note that abuse resistant drywall will require 20 gauge steel studs for support.
- Administration, student services, library, and other areas where the activities are more sedate are appropriate applications for standard drywall.
- Main washrooms and all shower areas require ceramic tile for the full height of the wall. In secondary smaller washrooms the ceramic tile need only cover the lower half of the wall.
- With the abundance of hard surfaces, acoustic control is a primary consideration. Acoustic tile ceilings are required in all learning and administration areas. Control of sound is critical in music and drama rooms, gymnasiums, stages and cafeterias. Fabric wrapped acoustic panels are required in all of these areas.
- Steel deck when utilized in gymnasiums must be an acoustic deck.
- Contrasting colours give important clues to people with visual challenges. Walls and floors should have colour contrasts as should walls and doorways.
- Colours are associated with various processes including relaxation, stimulation, focus and productivity. For example, pale yellow or coral is associated with stimulation; rust or hunter green promote relaxation, and the absence of certain colours with predominant use of beige and grey can result in loss of productivity. The effect of colours on learners should be taken into consideration when choosing wall finishes.

3.2 RELATIONSHIPS BETWEEN THE MAIN BUILDING ZONES

This section will introduce and describe the relationships between the five Main Building Zones:

1. Learning Areas
2. Assembly Areas
3. Administration/Student Support Services
4. Circulation
5. Building Support

3.2.1 LEARNING SPACES

Although every space in the school is a learning space, for the purpose of this discussion learning areas are defined as classrooms, learning support rooms, computer, science, arts, technical education, and family studies rooms, libraries and project rooms.

Libraries and computer intensive rooms are a transition space in that they relate to both student and community use. They must be close to the classrooms, but also within the semi-public area available for community use in a manner which will restrict after hours access to the remainder of the school.

Classrooms make up the largest block of space in the school. Groups of classrooms must be acoustically separated from noisy areas such as the gym and cafeteria and also high traffic areas such as lobbies and administration. Direct access to the exterior from academic clusters is important and should relate to the uses of the exterior spaces. e.g. proximity of primary and grade one to the children's playground, grades 5 and 6 to the outdoor basketball standards.

Inclusion of all students is promoted when learning support areas to accommodate learners with special needs are obviously a part of the main classroom.

For grouping of spaces within the teaching areas, refer to Section 3.3.1 Learning Spaces.

3.2.2 ASSEMBLY AREAS

Assembly areas such as the gymnasium, cafeteria, stage and various support areas shall be grouped together and be located so as to be accessible from the main lobby without travelling through the classroom areas. The assembly areas shall be acoustically separated from the learning areas. Corridors, storage rooms etc., shall be used to achieve this separation. The gym shall be located so as to provide easy and direct access to the play field. The kitchen shall have an exterior service door remote from the front door of the school and other exterior recreation areas. Note that the kitchen will have an extremely conspicuous and large exhaust fan which should not be directly visible when approaching the main entry.

To facilitate presentations on the stage a separate staging area is required, with a barrier free connection to the stage itself. The music room can be used as this staging area, however the barrier-free access should be kept in close proximity to the gym itself. The stage requires a large motorized projection screen.

3.2.3 ADMINISTRATION/STUDENT SUPPORT SERVICES

Administration areas include the Principal's office, general office, etc. Student Services include guidance, itinerant specialists, and other similar activities. Staff rooms are also included in this section.

Administration areas must be adjacent to the main lobby in order to provide a face to the visiting public to monitor and control access to the school. A visual line of sight to the elevator is required, as well as to the main lobby and to the main bus driveway and if possible the playground for smaller children.

The staff room and workroom should be apart from the administration, but within a reasonable proximity so that washrooms, workrooms, photocopiers, printers, etc. can be shared.

Guidance and related student services are very sensitive with regard to location in the school. Guidance spaces should not be visually associated with the administration or the teachers' rooms. Guidance and student service rooms should be located so that students can access these rooms with some discretion and without being in public view.

3.2.4 CIRCULATION

The main elements of circulation are corridors, lobbies and stairs. Lobbies will relate to how the students arrive and depart from the school, especially by school bus. Corridors and how they are configured will have the most impact of any design element on the character and operation of the school. A main stair must be located adjacent to the main lobby, visible to the General Office to monitor traffic in and out of the School. Secondary stairs will relate to other requirements for access to exterior spaces, playgrounds, etc.

Circulation areas must also provide areas for gatherings of students, small group discussions, and displays of visual arts produced by the students.

3.2.5 BUILDING SUPPORT

Washroom locations will be influenced by requirements for:

- separate washrooms for academic wings and assembly areas
- minimizing travel distances for students seeking washrooms
- provision of washrooms for community use areas
- barrier-free access to single washrooms

Building support spaces such as boiler, air handling, electrical, communications, storage rooms, etc., must be carefully located with respect to the other building zones.

Air handling rooms must be isolated from learning rooms. Storage rooms, locker rooms, etc. can be used for this purpose. Electrical rooms containing transformers must be remote from any areas occupied by students or staff. Boiler rooms should not open into corridors containing classrooms, etc. as this allows products of combustion to enter the school. Vestibules will not suffice; a remote location is required.

Communication rooms are required throughout the school. The longest practical run of computer cable is 300 feet. Communications rooms containing LAN servers require a counter and working space for technicians as well as additional ventilation.

3.2.6 RELATIONSHIPS TO THE EXTERIOR

The following relationships are important:

- Access to and from buses from the academic wing is perhaps the most critical relationship of interior to exterior. It must be direct, well marked, easy to monitor and control, and not cross any other type of vehicular traffic.
- Principal's office needs to view the main bus loop and if possible the small children's playground.
- Age sensitive play areas must be easily accessed by the respective group. For example, in order to travel to their playground, primary and grade one students should not have to travel through a crowd of grade six students.
- The gym requires direct access to the playing fields complete with vestibule to keep water and snow out of the gym. This access must be wheelchair accessible, and should not cross heavy vehicular traffic.
- Truck access to the kitchen, the boiler room, garbage area and the recycling room is required. Material deliveries must also be considered for music, drama and technical education areas.
- Cafeteria access to an outdoor terrace with south west exposure is desirable.

- Convenient access to outdoor learning areas is desirable.
- If the school site offers view to the surrounding countryside, the cafeteria should be located to capitalize on the view, otherwise the cafeteria should receive south or southwest light.
- The library should receive north light.

3.3 MAIN BUILDING ZONES - This section will describe how the various components within the five Main Building Zones relate to each other.

3.3.1 - LEARNING SPACES

Learning spaces are for the purpose of this manual, defined as classrooms, learning support rooms, computer, science, arts, libraries, and technology education/family study rooms. A complete list of learning spaces is found in Section 3.5 along with the specific room requirements.

This Sub-Section will review the relationships of various spaces within the designation "Learning Spaces".

Classrooms in all schools except senior high shall be grouped together in clusters in order to create families of students within the school. A cluster shall consist of not more than eight classrooms. Each cluster will include a minimum of two small group work areas, a teacher storage room and a corridor serving the cluster. Within the eight classrooms flexibility of groupings will be provided by interconnecting two of the eight classrooms with a moveable wall.

These classroom clusters will be zoned by age, curriculum, or any other designation as may be decided by the school.

Note: the requirement for two small group work areas and one teacher storage room for each classroom cluster can be averaged through the school. Some clusters can have more small group or break out areas if other clusters have fewer.

Learning Support Rooms are rooms where students can receive individual or small group instruction. In addition to the small group work areas in each classroom cluster, these rooms will be required for learners with special needs. It is important that these rooms be integrated into the classroom areas and not isolated in remote locations.

Library/Resource Centres should be considered as the heart of the school and given a prominent central location, easily accessible by the students and by the

community. Located within the library/resource centre will be a general library, office/work room, library seminar room, library resource room, multimedia project room, sound booth and storage room. All of these rooms will work together as one unit. They will be interconnected and have windows between rooms to facilitate supervision and monitoring.

Laboratory Classrooms are generally found only in secondary schools. Laboratory classrooms can be grouped as a cluster or spread throughout the classroom clusters. When general natural science labs are included in a school, it is convenient to design the chemistry, physics and biology differently as outlined in Section 3.5. If only one or two laboratories are programmed, the areas must be designed with greater flexibility in mind. Storage and preparatory rooms will also be required.

Specialized Arts Rooms will often be used after hours by both students and the community. They should be located to facilitate this after hours use. Proximity to assembly areas is important for rooms dedicated to music and the performance arts.

Technology Education/Family Studies Rooms can be located anywhere in the school. Consideration must be given to material deliveries. The heart of this group of activities will be a technology centre containing computers to be used to learn computer aided design techniques related to technology education and family studies activities. Adjacent to or integrated with the technology centre will be areas specializing in components of the specific school program (for example: nutrition, electro technologies, etc.)

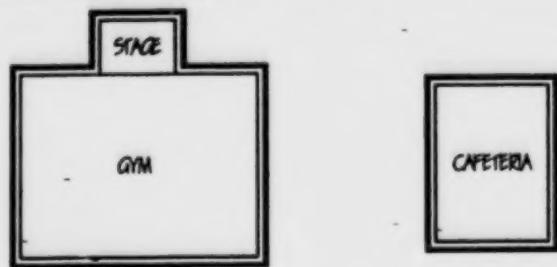
3.3.2 Assembly Areas

Assembly areas generally consist of the gymnasium, cafeteria, stage and related support areas. (For specific room requirements see 3.6 Assembly Areas)

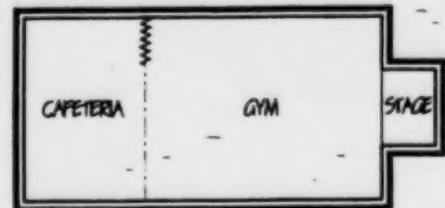
1. Optional Configurations

There are several possible configurations of gym/stage/cafeteria, depending on the intended usage of these spaces, the size of the spaces and the degree of flexibility required by the school. The specific school program will give guidance as to which of the following arrangements would be preferred:

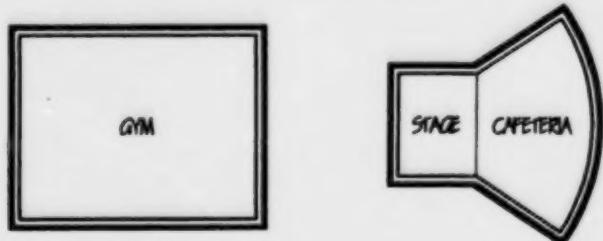
1. Gym and stage separate from cafeteria. In this configuration the stage shall be on the long dimension of the gym.



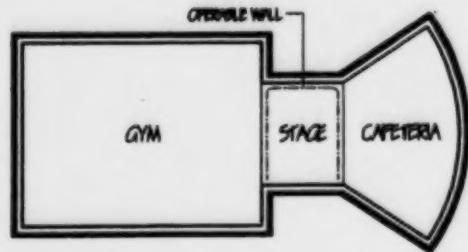
2. Adjacent gym and cafeteria connected with an operable wall. This permits a small gym or cafeteria to be expanded for special assembly uses.



3. Stage and cafeteria separate from gym. This configuration works well if a theatre type setting is desired as an alternate use of the cafeteria.



4. Gym/Stage/Cafeteria This configuration allows the stage to work with either the gym or the cafeteria or both. An operable wall is used to isolate the gym or cafeteria as required.



5. **Cafeteria/Stage/Music Room** - This grouping, usually separate from the gym, allows the stage to be used in conjunction with the cafeteria and also in conjunction with the music room. This combination provides a "second stage" for more intimate performances or for rehearsals. A moveable wall provides acoustic separation between the stage and the space not being utilized by the audience.



2. **Gymnasium**

1. **Single vs two station**

A two station gym can be subdivided with a curtain or moveable wall into two separate gyms. A two station gym is larger than a single station gym. In two station gyms independent access to the change rooms is required from each side of the gym. The requirement for one or two stations will be given in the specific school program.

2. Bleachers if required will be identified in the specific program.

3.3.3 **ADMINISTRATION/STUDENT SERVICES**

Administration/Student Services spaces fall into three main groups: Administration, Staff Rooms and Student Services Rooms.

Administration Rooms will be grouped around a control reception/waiting area and a general office, which will be staffed by one or more secretaries. Adjoining the general office area will be the principal's and vice principal's offices , a conference room and one or more sick rooms. The sick room(s) requires proximity to a washroom and must be able to be easily monitored by the secretary.

Staff Rooms should be set apart from the administration area and will be subdivided into two separate areas; one of which will be a work room. A small kitchen, two barrier-free washrooms and a coat room will adjoin the staff room. Independent use of the coat room, kitchen and washroom must be possible without entering the staff room or the work room. The work room should have independent access without going through the staff room.

Student Services provide support services to both students and teachers. Examples are: guidance, itinerant specialists and services offered by community agencies. Student Services spaces should open into a reception space containing a secretarial area and comfortable chairs. All doors should have windows. Student services areas should not be visible from the administration area as this may discourage students from using the facilities.

Guidance Centres will be smaller consulting offices grouped around a central area containing displays and a table and chairs. A separate, secure room is required for storage of student records.

Itinerant Specialists offer services relating to visual impairment, hearing impairment, learning disabilities, integration support, etc. Also included are speech language pathologists, school psychologists and social workers. One, two or three rooms may be required (see specific school program for exact requirements). One of these needs to be large enough to accommodate program planning teams (12-15 people) and advisory groups such as Comprehensive Guidance and Counselling and Student Advisory Committees. Natural light is required.

Community Support Agency Personnel could include a community liaison officer, a public health nurse or a mental health worker. In junior and senior high schools areas for teen health centres and wellness centres are often identified as critical components in meeting the needs of learners. The specific school program will identify when these rooms are required. If two community support rooms are required, one may be an office/meeting room and another be equipped with locked storage spaces for medical supplies and a refrigerator. This room should be adjacent to a washroom, or part of a teen health/wellness centre.

Teen Health Wellness Centres are normally designed with a door to the exterior so that students can enter and leave discretely.

3.3.4 CIRCULATION

Circulation spaces will set and define the character of the school:

1. Way Finding: The layout of circulation spaces should be straight forward

- and simple to encourage easy way finding.
2. **Welcoming:** The lobby provides the first impression of the school. It should be spacious, bright and be naturally lit. The size should be in proportion to the size of the school, and be capable of containing large numbers of people for student arrivals and community use. The lobby and corridors should also provide display space for cultural representation of the community and student artwork.
 3. **Discipline** will be facilitated by the character and layout of the corridors. Long straight corridors are difficult to supervise and are not conducive to quiet movement of large numbers of students. Short L-shaped corridors can be supervised by one teacher positioned at the bend in the corridor able to look both ways. A square doughnut shape provides four short corridors, easily supervised by two teachers. This easily supervised space has also been found to be conducive to quiet student circulation.
 4. **Student Comfort:** A large school with seemingly endless corridors and teaching areas remote from the heart of the school can lead to student alienation, feelings of not belonging to the school and general discomfort. A compact series of looped corridors (rather than dead end type corridors) will encourage student participation and general comfort. Natural light in corridors also adds to student comfort.
 5. **Stairs:** One large stair must be located adjacent to the entrance lobby to facilitate large movements of people at arrival and dismissal times. The locations of other stairs will be determined by student movement generated by other activities such as recesses, assembly, access to play fields, etc.
 6. **Elevator:** One elevator must be provided for all schools of more than one storey. A full size elevator is required, key operated. The location must consider ease of supervision and community use. Proximity and visibility from the administration offices are required.
 7. **Lockers/coat racks:** The corridors must provide sufficient space for lockers for students in middle, junior and senior high schools. One full size locker per student is required. For elementary schools, coat racks and benches are required. Coat rack heights for grades P, 1 and 2 will be lower than for grades 3-6. Lockers and coat racks must be in reasonable proximity to the learner's classroom and be barrier-free.

8. **Student Arrival and Departure** must be considered in the circulation layout. In larger schools served by many buses a logical system of arriving at and departing from the classroom areas must be devised.

3.4 BUILDING SYSTEMS GENERAL

3.4.1 HOW M & E SYSTEMS AFFECT THE ENVIRONMENT FOR LEARNING

Mechanical and electrical building support systems can have a profound effect on the Environmental Quality of the learning spaces. Even when these systems are working perfectly, they can be intrusive and disruptive if not properly designed and located.

Boiler Rooms containing fuel fired appliances must be in a location remote from the learning, administration and assembly areas. Noise and vibration are serious concerns. In addition, products of combustion must not be able to migrate to any part of the school either through the corridors or the air handling system. Boilers providing steam for humidification cannot be located in air handling rooms for the same reasons.

School Ventilation - the school will require large quantities of fresh (outside) air to be delivered to every room. In most areas of the school this must be 100% outside air.

The large volume of air movement required in a school will usually result in more than one air handling unit in order to keep the ducts down to a manageable size. This provides an opportunity to provide air handling zones within the school.

The gymnasium and related areas will have a separate unit which can operate independently from the learning areas. This provides the opportunity to ventilate community use areas after normal school areas. Consideration should also be given to other community use areas such as the cafeteria, library, etc.

This distribution of air handling equipment around the school raises several challenges. Noise and vibration are always associated with these units, which must never be located over or beside a learning space. Other spaces such as washrooms, storage rooms, etc. must be used as sound and vibration buffers.

Duct sizes will affect air handling noise, and sufficient space must be provided by the Architect to allow the Engineer to design properly sized and proportioned ducts. This is especially applicable to corridors and ceiling spaces above classrooms.

Air handling rooms must be provided so that air handling systems can be located in doors. Proper servicing of the units is required. Poor servicing will guarantee poor air quality. Proper servicing requires easy access to the air handling equipment, by stairs not ladders, and enough space within the air handling room to permit access to filters, motors, etc.

The location of air intake louvres with respect to exhaust louvres, chimneys, school buses, parked cars, existing sources of pollution, prevailing winds, etc. must be carefully considered. The location of exhaust louvres relative to neighbouring occupancies is also a consideration due to the large volumes of air being exhausted.

Electrical Rooms often containing transformers and must be located remote from learning and administration areas.

Communications Rooms will have to be distributed throughout the school so that the largest run of data cabling will not exceed 300'. Rooms containing servers require additional ventilation and a small working counter.

3.5 LEARNING SPACES

3.5.1 CLASSROOM GROUPINGS

All classrooms require the flexibility to allow the teacher to work with the entire class or to have the class break into smaller activity groups. Space must also be provided for the computers and printers, as well as an overhead projector and ceiling mounted screen.

1.- Typical Classroom

1. Activities: whole class activity/small activity groups/individual study
2. Size: minimum 900 SF per classroom
3. Cabinets: four units each 4' wide x 7' high as follows:

Unit One:

Base Cabinet: 24" deep x 36" high containing two drawers over shelving containing one fixed (bottom) shelf and one adjustable shelf, behind two lockable doors.

Upper Cabinet: 24" deep x 48" high containing one fixed and two adjustable shelves, behind two lockable doors.

Unit Two:

Base Cabinet: one counter 24" deep, open below and containing one barrier free sink. Counter height 32".

Upper Cabinet: 12" clear inside x 32" high containing one fixed and one adjustable shelf. The upper cabinet is to be mounted 16" above the counter top.

Unit Three:

Base Cabinet: one counter 24" deep over one fixed bottom shelf and two sloped fixed shelves for bristol board, etc.

Upper Cabinet: same as unit two..

Unit Four:

Base Cabinet: 24" wide contain four lateral file drawers, lockable.

Upper Cabinet: same as unit one.

4. Communications:
 - telephone
 - public address
 - media retrieval
 - Video/Data projector
 - seven dual LAN* outlets to be grouped as follows: one cluster of four outlets, one outlet at the teacher's station and two outlets in the floor
 - one TV outlet
 - LAN, audio and TV outlets as required for the video-data projector
5. Electrical:
 - two duplex power outlets beside each dual LAN outlet, an outlet for television, an outlet for the projector and two general duplex outlets
 - 70 foot candles of lighting able to be reduced by 33% or 66%
 - * - LAN = Local Area Network to link all the school computers, printers etc. to a central server. Also called "Structural Wiring". These outlets can provide voice or data.
6. Finishes:
 - floor: resilient tile or resilient sheet flooring
 - walls: painted concrete block or abuse resistant drywall on all surfaces not protected by boards, cabinets, etc.
 - ceilings: acoustic tile
7. Acoustical:
 - separation between adjacent spaces minimum STC 48 (STC = sound transfer coefficient)
 - sound level in unoccupied room, max. 40 dBA (dBA = decibells)
8. Special Equipment:
 - Communication Boards:
 - 64 SF on front wall, 16 SF on side wall
 - Tackboards
 - one foot high strip above all communication boards (elementary only)
 - total of 150 SF distributed on other walls
 - one overhead projection screen
 - one ceiling-mounted video data projector
 - one separate RF (TV) tuner and decoder for close captioning to work with the LCD video projector
 - room darkening: vertical blinds
9. Moveable Walls:
 - in each group of 8 classrooms, one moveable wall shall be provided to allow two classrooms to be opened into one large (double) classroom
 - minimum sound rating of moveable walls - STC 50.
10. Mechanical: one barrier-free sink

2. Primary Classrooms

1. Same as typical classroom except:
 - a wheelchair accessible washroom shall be provided, accessed directly from the classroom (standard size water closet)
 - tackboard area shall be 250 SF
 - coat hooks and benches shall be provided within the classroom to accommodate 30 children
 - the base counter shall be 24" high
 - the communication board on the front wall shall be mounted so that the height from the floor to the bottom trim is 24"

3. Grade 1 Classrooms

1. Same as typical classroom except:
 - base cabinet height 24"
 - front communication board 24" from trim to floor

4. Language Classroom: same as typical classroom except for the addition of six dual LAN outlets.

5. Small Group Work Area

1. A break out activity room for up to ten learners, also suitable for teaching small groups or one-on-one learning
2. Size - 375 SF

3. Cabinets

- base cabinet: min. 18 lineal feet x 24" wide x 36" high
 - adjustable shelving complete with hinged doors, all lockable
 - one unit of shelving to be 40" wide
- wall cabinets: min. 9 lineal feet x 12" clear inside width
 - 4' with doors, lockable - 5' open shelving

4. Communications

- telephone
- public address
- six dual LAN outlets
- one TV outlet
- media retrieval

5. Electrical

- two duplex outlets per LAN outlet, one for TV plus two general outlets
- lighting as per typical classroom

6. Finishes: as per typical classroom

7. Acoustical: as per typical classroom

8. **Special Equipment:**
 - communications boards - as per typical classroom except 40 SF required
 - tackboards: same as typical classroom except 40 SF required
 - room darkening: vertical blinds
6. **Teacher Storage Rooms**
 1. To be used by a number of teachers for storage of resource material.
 2. Size 110 SF.
 3. Cabinets: as per small group work area except:
 - base cabinet: min. 10 lineal feet all lockable
 - wall cabinets: min. 10 lineal feet 50% open, 50% with doors, lockable
 4. Communications:
 - one dual LAN network outlet
 5. Electrical:
 - two duplex outlets
 - lighting: 50 foot candles
 6. Finishes: as per typical classroom
7. **Learning Support Room**
 1. Activity: teaching learners with special needs in small groups or individually.
 2. Size: 1500 SF - included in this space is a 150 SF work room. The work room requires both windows and a door to the main learning support room.
 3. Cabinets: as per typical classroom plus:
 - a barrier free residential style kitchen/laundry unit consisting of 30 lineal feet of base cabinet incorporating a counter top range, a wall oven, a microwave oven, a dishwasher, a 30" refrigerator/freezer, a double sink, a clothes washer and a clothes dryer
 - built-in bookcases providing a minimum of 60 lineal feet of shelving 12" deep (i.e. 4 rows x 15' long)
 - a built-in storage pantry style storage unit containing a minimum of 5 adjustable shelves x 18" wide x 6' long, with lockable doors
 - shelving to accommodate thirty storage trays each 18" x 30" x 8" deep
 4. Communications: as per typical classroom plus two LAN network outlets and one telephone outlet in the work room.
 5. Electrical: as per typical classroom plus:
 - the ability to turn off all the fluorescent lights and to provide 50 foot candles of illumination with incandescent pot lamps. Pot lamps to be on dimmers.
 - special electrical as required for kitchen/laundry unit
 6. Finishes: as per typical classroom.
 7. Acoustical: as per typical classroom.

8. Special Equipment: as per typical classroom plus:
 - one moveable wall to subdivide the main room in half. This wall requires a door and a window and an STC rating of 48.
 - one accordion style folding door to screen the kitchen/laundry area when not in use
 - appliances as noted for the kitchen/laundry area
 - one under counter, lockable fridge for storage of medicine
 - one communication board (4'x4') and one tackboard (4'x4') in the work room
9. Special Considerations:
 - this room should be located in the heart of the area of classroom clusters and not isolated to a remote location in the school.
 - this room must be adjacent to the assistive care washroom (item 8 following) A door to this washroom is required.
10. Mechanical: plumbing and ventilation as required for the kitchen/laundry unit.

8. Assistive Care Washroom

1. Activities:
 - independent use by learners with special needs
 - assisted use
 - a changing table
 - showering
2. Size 150 SF
3. Cabinets:
 - a counter with a double sink, min. 5' long
 - a secure cupboard mounted at least 24" above the floor. Minimum size 30" x 36" x 18" deep
4. Communications: one emergency pull cord station and public address system
5. Electrical:
 - one duplex power outlet
 - Lighting: 50 foot candles
6. Finishes:
 - Floor: ceramic tile
 - Walls: ceramic tile full height
 - Ceiling: painted drywall
7. Acoustical: separation from adjacent spaces min. STC 48
8. Special Equipment:
 - Barrier free sink
 - Barrier free water closet with grab bars as required for independent use by learners with special needs

- a barrier free shower with a detachable shower head and a long flexible hose
 - a changing table 24" wide x 72" long. Could be fold-down or permanent
9. Special Consideration:
- must be adjacent to the learning support room. A connecting door is required
 - space must be provided beside the water closet to allow for two assistants, one on each side
10. Mechanical:
- Plumbing as required, including a floor drain

3.5.2 LIBRARY/RESOURCE CENTRE

A group of rooms providing the traditional library services in conjunction with multi-media resources. All of these rooms should interconnect and have half height windows between rooms to facilitate supervision and monitoring.

1. General Library
1. A space for individual study and group learning. Required are: a circulation area, a card catalogue and public access terminals, a reference area, seating areas, computer work stations, shelving for print and audio visual resources and shelving for audio visual equipment, library stacks, book and periodical display and book and periodical lending.
 2. Size: See the individual school program.
 3. Circulation Desk:
 1. Base cabinet 20 lineal feet x 30" wide x 30" high. Barrier-free from both sides.
 2. Open shelving on work side except for two knee spaces.
 3. Incorporate a through-wall book drop from the corridor.
 4. Communications:
 - telephone
 - public address
 - media retrieval
 - fourteen dual LAN outlets, two at the circulation desk, six on perimeter walls and six on floor mounted outlets
 - LAN and audio and TV outlets as required for the video/data projector
 - one internal broad cast outlet for TV system
 - one security book monitoring system
 5. Electrical:
 - two duplex power outlets beside each dual LAN outlet plus power to projector plus five general duplex outlets
 - lighting: as per typical classroom

6. Finishes as per typical classroom except painted drywall is acceptable as a wall finish.
7. Acoustical: as per typical classroom
8. Special Equipment:
 - communication boards - as per classroom except 40 SF required
 - tackboard - as per classroom except 40 SF required
 - one ceiling mounted video data projector
 - one ceiling mounted screen
 - room darkening - vertical blinds
 - book shelving, adjustable, with hardwood end panels
 - periodical display
 - computer software and video shelving

2. Office/Work Room

1. Lockable room to serve as an office work room to catalogue and repair books - Should be adjacent to the circulation desk.
2. Size: 150 SF
3. Cabinets:
 1. 12 lineal feet of base cabinet x 32" high x 30" wide, with adjustable shelving and lockable doors. Provide one knee space 30" wide.
 2. 12 lineal feet of overhead cabinet x 30" high x 12" clear width inside, with adjustable shelving, 50% open, 50% lockable doors.
4. Communications:
 - telephone
 - two dual LAN outlets
 - media retrieval source rack and TV monitor
 - LAN server
5. Electrical:
 - two duplex power outlets beside each dual data outlet, plus three outlets for the media retrieval source rack.
 - lighting as per classrooms
6. Finishes: as per library
7. Acoustics: as per library
8. Window to library
9. Mechanical: one sink

3. Library Seminar Room

1. A room for group study
2. Size 750 SF
3. Cabinets/Storage:
 - base cabinet as per small group work area except 12 lineal feet, lockable
 - wall cabinet as per small group work area except 12 lineal feet, 50% open and 50% with doors, lockable

4. Communications:
 - ten LAN network outlets
 - medial retrieval
 - video data projector
 - public address
 - one internal broadcast outlet for TV system
 - two TV outlets
5. Electrical:
 - two duplex outlets per LAN outlet plus one for each TV outlet
6. Finishes: as per library
7. Acoustical: as per library
8. Special Equipment:
 - communication board - as per classroom, except 2 @ 20 SF
 - tackboard as per classroom except 2 @ 20 SF
 - two wall mounted projection screens, manual
 - room darkening: vertical blinds
9. Moveable Walls: one wall to divide the room in half - STC rating 50
10. Windows to an adjacent room for supervision

4. Multi-Media Project Room:
 1. A room where students can utilize specialized multi-media equipment not available in other areas of the school. Students will be working individually or in small groups.
 2. Size: 450 SF
 3. Cabinets: as per small group work area
 4. Communications:
 - six dual LAN outlets
 - one TV outlet
 - public address
 - one internal broadcast outlet for TV system
 5. Electrical: Power
 - two duplex outlets per dual LAN outlet plus one per TV outlet plus five general outlets
 - lighting as per typical classroom
 6. Finishes: as per library
 7. Acoustical: as per Library
 8. Special Equipment:
 - communications board - 40 SF
 - tackboard 40 SF
 - wall mounted projection screen
 - room darkening - vertical blinds

9. Windows to library

5. Sound Booth:

1. A sound recording booth to support recording and editing of audio for use in multi-media productions. Accessible through multi-media room.
2. Size: 150 SF
3. Cabinets: base cabinet 10 lineal feet lockable, wall cabinet 10 lineal feet lockable
4. Communications: five dual LAN outlets
5. Electrical:
 - twelve duplex outlets
 - lighting as per classroom
6. Finishes:
 - acoustic panels on three walls
 - acoustic ceiling
 - resilient tile or sheet flooring
7. Acoustical:
 - separation from adjacent occupancies - STC 60
 - sound level in unoccupied room 25 dBA
8. Special Considerations:
 - window and door to multi-media Centre
 - air conditioned

6. Storage Room

1. A secure room for storage, distribution and maintenance of valuable items which are available for borrowing by students and teachers.
2. Size: 150 SF
3. Cabinets:
 - adjustable shelving a minimum of 8 lineal feet x 18" deep x 5 shelves high, plus 10 lineal feet x 24" deep x 5 shelves high
 - one workbench minimum 8' long x 36" wide, 32" high complete with three 8' long x 12" shelves over.
4. Communications:
 - two dual LAN outlets
 - one telephone
 - one cable TV outlet
5. Electrical:
 - two duplex outlets per LAN outlet
 - lighting as per classroom
6. Finishes as per library
7. Acoustical as per library
8. Dutch door complete with 12" wide shelf

3.5.3 LABORATORY CLASSROOMS

Note: In each laboratory, one work station must be wheelchair accessible (barrier-free).

1. Chemistry Lab
 1. Activities: group or individual laboratory experiments, plus whole class activity. The room should be zoned for class discussion at one end and lab work at the other.
 2. Size: See specific school program.
 3. Cabinets:
 1. Lab Benches:
 - island or peninsula style, fixed
 - counter space for six students to work as a group
 - bench tops to be epoxy resin
 - five stations required
 - one lab sink per station
 - provide storage cabinets under lab benches
 2. Demonstration Bench
 - similar to lab bench
 - minimum 8' long
 3. Other cabinets - one unit as per typical classroom except epoxy resin counter tops.
 - Eighteen lineal feet of lower cabinets, 32" high x 30" wide complete with adjustable shelving and lockable doors and drawers of various sizes.
 - Eighteen lineal feet of upper cabinets, 30" high x 12" clear inside with adjustable shelving and glass doors, lockable.
 4. Wall Cabinets - as per typical classroom except:
 - all doors lockable
 - all doors to have glass panels
 4. Communications:
 - as per typical classrooms plus:
 - one dual LAN outlet at each lab bench station plus one at demonstration bench
 5. Electrical:
 - as per typical classroom plus outlets at each lab bench
 - lighting as per typical classroom.
 6. Finishes: as per typical classroom.
 7. Acoustical: as per typical classroom.
 8. Special Equipment: as per typical classroom plus:
 - emergency shower station complete with drain
 9. Mechanical: sinks and waste piping to be acid resistant

2. **Laboratory Storage/Preparation Room**
 1. Activities:
 - storage of science equipment and supplies
 - preparation for experiments
 - clean up of equipment
 2. Size:
 - minimum 110 SF
 - distribution: one required for every two science laboratories. Note: if only one lab is programmed provide one storage/preparation room
 3. Cabinets: as per small group work area (3.5.1.5) except counter top to be epoxy resin.
 4. Communications: one dual LAN network outlet
 5. Electrical:
 - four duplex outlets
 - lighting as per typical classroom
 6. Finishes: as per typical classroom.
 7. Special Considerations: no windows are permitted to provide security for chemical storage and an opportunity for light controlled experiments.
 8. Special Equipment:
 - one acid resistant storage cabinet for acids and one for bases, vented to the exterior
 - one fireproof solvent storage locker
 - one fume hood exhausted directly to outdoors
 - one eye wash station
 9. Mechanical:
 - one large "clean-up" sink with drying rack for glassware
 - sink and waste piping to be acid and solvent resistant
3. **Physics Lab**
 1. Activities: group or individual physics experiments plus whole class activity.
 2. Size: see specific school program.
 3. Cabinets:
 1. Lab Benches
 - locate on perimeter walls
 - minimum of 75 lineal feet
 - provide lockable storage units complete with adjustable shelving and drawers of various sizes, lockable
 - counter tops to be epoxy resin
 2. Other Cabinets - as per typical chemistry lab
 3. Demonstration Counter as per chemistry lab
 4. Communications as per typical classroom plus:
 1. Five additional dual LAN outlets at lab bench and one at

- demonstration counter.
5. Electrical as per typical classroom.
 6. Mechanical:
 - five sinks at lab bench
 - one sink at demonstration counter
 7. Finishes as per typical classroom.
 8. Acoustical: as per typical classroom.
 9. Special Equipment: as per typical classroom.
4. Biology Lab identical to Chemistry Lab.
 5. Information Technology:
 1. For whole class computer studies, to accommodate 30 learners and computers at a minimum of 10 free standing tables.
 2. Size: 1500 SF
 3. Cabinets: as per typical classroom except all lockable.
 4. Communications: as per typical classroom except:
 - 25 dual LAN network outlets
 - a total of 15 delivered to the freestanding tables via underfloor conduit
 - 10 distributed around the perimeter of the classroom
 5. Electrical:
 - two duplex outlets beside each dual data outlet plus power to projector and screen
 - indirect lighting delivering 50 foot candles in three levels
 6. Finishes: as per typical classroom.
 7. Acoustical: as per typical classroom.
 8. Special equipment: as per typical classroom.
 6. Business identical to Information Technology.
 7. Other: see individual school program for requirements.
If no details are available use the physics lab requirements and modify to suit particular room use.

3.5.4 ARTS

1. Visual Arts:
 1. Activities: whole class or small group study or individual instruction in the visual arts.
 2. Size: 950 SF min. - larger if required by specific school programs.
 3. Cabinets: as per typical classroom, plus 15' lineal feet of base cabinet x 30" wide x 32" high with adjustable shelving and lockable doors, plus 15 lineal feet of wall cabinet x 30" high x 12" clear inside with adjustable shelving

- and lockable doors.
4. Communications: as per typical classroom.
 5. Electrical: as per typical classroom plus power to specialized items such as kilns, etc. (see specific school program).
 6. Finishes: as per typical classroom.
 7. Acoustical: as per typical classroom.
 8. Special Equipment: as per typical classroom plus specialized equipment as per specific school program.
 9. Mechanical: as per typical classroom except:
 - two oversize sinks are required, connected to a sediment interceptor
 - designated exhaust for specialized items such as kilns, foundry, etc. (see specific school program)
2. Multi-Purpose Arts Room
1. Activity: whole class studies in dramatic arts, dance, etc. see specific school program which may have more information.
 2. Size: 1100 SF minimum , larger if required by specific school program
 3. Cabinets: as per typical classroom.
 4. Communications: as per typical classroom.
 5. Electrical: as per typical classroom plus track lighting to light one wall.
 6. Finishes: as per typical classroom.
 7. Acoustical: as per music room.
 8. Special Equipment: as per typical classroom plus
 - fabric covered acoustic panels on 3 walls, covering a minimum of 20% of each wall surface
 - black curtains along one wall (the wall facing the track lighting)
 9. Special Considerations:
 - double doors to corridors
 - locate near stage
 10. Mechanical: as per typical classroom except one large double sink with a sediment interceptor
3. Arts Storage Room
1. Activity: Support, storage and preparation for arts activities
 2. Size: 150 SF
 - Distribution: one for every two visual and or multi-purpose arts rooms
 3. Cabinets: as per teacher's storage rooms
 4. Communications: as per teacher's storage rooms
 5. Electrical: as per teacher's storage rooms
 6. Finishes: as per typical classroom.

4. Music

1. Activities: Music Instruction for bands, string groups, etc.
2. Size:
 - 1200 SF minimum. Larger if so identified in specific school program.
 - the proportions and shape of the music room are critical: the height should be not less than two thirds of the largest horizontal dimension.
 - the side walls of the music room should not be parallel
 - the ceiling should be sloped or curved
3. Cabinets: as per typical classroom.
4. Communications: as per typical classroom.
5. Electrical:
 - Power as per typical classroom plus two additional outlets on dedicated circuits for amps, etc.
 - Lighting: as per typical classroom.
7. Finishes: as per typical classroom plus acoustic wall panels
8. Acoustical:
 - Sound transfer to adjacent rooms must be diminished. Where possible, storage rooms corridors, etc. should be utilized as sound breaks. Where this is not possible, a minimum STC rating of 60 is required between the music room and or any adjacent occupancies. A rating of 50 is acceptable for corridor walls. Learning spaces cannot share a common wall with the music room.
 - sound level in unoccupied room : 35 dBA
 - the acoustical quality of this room is critical and is improved dramatically with the addition of fabric covered acoustic wall panels. A minimum of 25% of the wall surface must be covered with these panels.
9. Special equipment: as per typical classroom except:
 - only the front communication board is required.
10. Special Considerations:
 1. Door to be a double door (6' wide) and to be sound retardant

5. Music Storage Room:

1. Activities: Storage and cleaning of instruments
2. Size: 150 SF (could be incorporated within the music room)
3. Cabinets:
 - : Base cabinet
 - minimum 10' long
 - lockable doors
 - adjustable shelving
 - : Wall Cabinet
 - minimum 10' long
 - lockable doors
 - adjustable shelving

- : Instrument lockers
 - varying sizes to accommodate both large and small instruments
 - lockable doors
 - a minimum of fifty individual lockers
- 4. Communications: one dual LAN network outlet.
- 5. Electrical:
 - two duplex outlets
 - Lighting: 50 foot candles
- 6. Finishes: as per typical classroom.
- 7. Mechanical:
 - sink must be oversize to permit cleaning of large instruments. Minimum 33" long x 15" wide x 12" deep

3.5.5 TECHNOLOGY EDUCATION AND FAMILY STUDIES

- Note:**
- 1. Technology education and family studies are moving from single use facilities to multiple use labs. Multiple use labs might contain a design and a production area. It will be necessary to ensure that production areas can be isolated, if necessary, to maintain a "clean" environment in the design area.
 - 2. In each area, one work station must be wheelchair accessible (barrier-free).
- 1. Technology Area
 - 1. Activities: Small group learning of computer aided design techniques related to family studies and technology education. To accommodate 15 students at a minimum of 5 free standing tables.
 - 2. Size: 950 SF
 - 3. Cabinets: as per typical classroom.
 - 4. Communications: as per typical classroom except:
 - 25 dual LAN outlets
 - a total of 15 delivered to the free standing tables via underfloor conduit
 - 10 distributed around the perimeter of the room
 - 5. Electrical:
 - two duplex outlets beside each dual LAN outlet
 - indirect lighting to deliver 70 foot candles in 3 levels
 - 6. Finishes: as per typical classroom.
 - 7. Acoustical: as per typical classroom.
 - 8. Special Equipment: as per typical classroom
 - 9. Windows to adjacent tech/family studies area

2. **Food Area**
 1. Activities: Small group learning of nutrition and food preparation.
 2. Size: 750 SF
Note: a special room is not a requirement. This area could be combined with other areas such as clothing/textiles.
 3. Cabinets: four stations to accommodate four students each.
 - each station to provide a minimum of 19 lineal feet of kitchen style base cabinet and 19 lineal feet of wall cabinet including a range with oven, a double sink and a microwave oven, a bank of drawers and adjustable shelving behind lockable doors.
 - one of these four stations is to be barrier free. This will require a wall oven and a counter top stove with front or side mounted controls
 - in addition, the following are required:
 - a 7' high x 4' wide pantry style unit
 - one upright freezer - 17 cu. ft.
 - one large refrigerator - 20 cu. ft.
 - one built-in residential style dishwasher
 - floor to ceiling built-in storage units - 10 lineal feet x 24" deep with adjustable shelving and lockable doors
 4. Communications: as per typical classroom
 5. Electrical:
 - Power: as per typical classroom plus power for appliances
 - Lighting: as per typical classroom
 6. Finishes: as per typical classroom
 7. Acoustical: as per typical classroom
 8. Special Equipment: as per classroom except 64 SF tackboard plus equipment as described in cabinets paragraphs.
 9. Mechanical: provide plumbing to suit sinks, etc. and ventilation for range.
Note that the range hoods will require dedicated exhaust to meet NFPA 96 requirements.
3. **Clothing/Textiles Area**
 1. Activities: Small group learning of fabric design and manufacturing.
 2. Size: 750 SF
Note: A special room is not a requirement. This area could be combined with the nutrition area which would provide a large common area for cutting of material, tasting of food, etc.
 3. Cabinets:
 - built-in tables to accommodate individual sewing machines or a combination of several built-in sewing stations plus multi-purpose tables where sewing machines can be set up plus storage cabinets to house these sewing machines when not in use.
 - one laundry station including 5 lineal feet of case cabinet, a domestic

- washing machine, a domestic clothes dryer and a double sink.
- provision to accommodate two computerized sewing machines. These will have their own cabinets.
 - floor to ceiling storage unit with lineal feet long x 24" deep with adjustable shelving behind lockable doors.
 - one barrier free change room c/w full size mirror
4. Communications: as per typical classroom.
Note: if the space is shared with nutrition, the telephone, intercom station, media retrieval and cable TV outlet can be shared.
5. Electrical: as per typical classroom plus 10 outlets for sewing machines, etc., plus washer and dryer.
6. Finishes: as per typical classroom.
7. Acoustical: as per typical classroom.
9. Special Equipment: as per typical classroom except:
 - special equipment can be shared with nutrition if the spaces are located in the same room.
 - 64 SF communication board
 - provide equipment as noted in the cabinets paragraphs.
10. Mechanical: mechanical as required for washer and dryer, etc.
4. Production Area:
1. Activities: Whole class and small group learning design and manufacturing of wood and metal products. These can be part of a multi-use lab that combines design and production.
 2. Size: 1500 SF
 3. Cabinets: as per typical classroom plus one floor to ceiling storage unit, 30' long x 30" wide with adjustable shelving behind lockable doors.
 4. Communications: as per typical classroom.
 5. Electrical: as per typical classroom plus power for special equipment.
 6. Finishes: as per typical classroom.
 7. Acoustical: as per typical classroom.
 8. Special Equipment: as per typical classroom plus:
 - special equipment as per specific school program
 - if woodworking equipment is provided, a method of sawdust collection and exhaust is required
 9. Mechanical: as per typical classroom plus one large set tub type style sink.
5. Multi-Purpose
1. Activities: other technology education or family studies activities as identified in the specific school program.
 2. Size: minimum 750 SF or larger if so identified in the specific school program.

3. For other requirements start with a typical classroom and modify as required for the specific activity.

3.6 ASSEMBLY AREAS

1. Gymnasium:
 1. Activities: Learning group and individual physical skills/team sports and large group assemblies.
 2. Minimum Sizes: (note: individual school programs may call for larger gyms)
 - Elementary 3250 SF (50' x 65' x 18' clear height)
 - Middle/Junior High: 7100 SF (71' x 100' x 20' clear height)
 - Senior High: 8400 SF (84' x 100' x 23' clear height)
 3. Cabinets: under stage chair storage if stage is adjacent to gym.
 4. Communications:
 - public address
 - three dual LAN outlets
 - one internal broadcast outlet for TV system
 - assistive listening for hearing impaired
 - one TV outlet
 - sound system independent of public address system (see also electrical section)
 - 30 second clocks system for basketball
 5. Electrical:
 - two duplex power outlets for each dual LAN outlet
 - power for all communications systems
 - fifteen duplex outlets for general use
 - power to special equipment
 - Lighting: indirect, metal halide fixtures, dimmable to provide 50 foot candles
 - back up incandescent system
 - arrange fixtures so that lights close to stage can be turned off separately from the other fixtures
 6. Acoustical: separation from adjacent spaces STC 48. Learning spaces cannot share a common wall with the gym.
 7. Finishes:
 - hardwood pneumatic floor, or poured urethane floor
 - exposed roof structure, painted
 - walls: concrete block
 - acoustic panels are required to improve the sound quality of the room. Provide a minimum of one row of 8' high panels on each wall of the gym. Panels are to be acoustic insulation wrapped in fabric and trimmed with hardwood top and bottom to protect the panels from mechanical damage.

8. **Special Equipment:**
 - score board provided by others, wired under this contract
 - basketball backstops:
 - one at each end square, transparent and electrically operable
 - two on each side: metal wall mounted side swing manually operated if room layout permits, otherwise ceiling mounted, swing up, electrically operated
 - all elementary backstops to be adjustable down to 8' high
 - high school and middle/junior high school gyms to have an electrically operated ceiling mounted gym divider curtain to subdivide the gym into two equally sized rooms
 - all gym floors to have game-lines to Department of Education and Culture Standards
 - for additional equipment see Section 8 - Equipment
 - bleachers: provide bleachers if called for in individual school program
 - tackboard 75 SF in an area associated with the gym area
9. **Special Considerations:**
 - all doors to swing out from gym
 - door frames to be mounted flush with the interior side of the gym wall and to be designed to minimize the amount of frame and stop area exposed to the interior of the gym
 - if vestibules are not provided at exterior doors, a section of hard tile floor at least 3' in one dimension x the combined width of all of the exit doors is required to provide protection for the floor
10. **Mechanical:** one refrigerated water cooler located in close proximity to the gym

2. **Activity Multi-Purpose Rooms**
 1. **Activity:** Physical activity such as workouts, weights, etc.
 2. **Size:** 950 SF
 3. **Cabinets:** not required
 4. **Communications:**
 - public address system
 - one dual LAN network outlet
 5. **Electrical:**
 - Power: three general purpose duplex outlets
 - Lighting: 50 foot candles
 6. **Finishes:** as per typical classroom
 7. **Special consideration:** windows to gym to facilitate monitoring
3. **Change and Shower Rooms**
 1. **Activity:** change areas for whole class groups or athletic teams complete with washroom and shower facilities.

2. Size: (two required)

Elementary:

- accommodate 30 persons each
- provide one water closet for females
- provide one water closet and one urinal for males
- provide one lavatory each
- provide one barrier-free individual shower each

Note: The usual configuration is a washroom located within each change room. This barrier-free washroom contains the lavatory, water closet and shower.

Middle/Junior High: as per elementary except the following fixtures are provided:

- two water closets for females
- one water closet and one urinal for males
- two lavatories each
- two showers and two dressing compartments each (one to be barrier-free)

Senior High School: as per Middle/Junior high the number of shower stalls and dressing compartments is increased to six for males and six for females.

3. Cabinets: vanity cabinets for sinks

4. Communications: intercom speakers only

5. Electrical:

- Power: two outlets at sink area
- Lighting: 30 foot candles

6. Finishes:

- Change area
 - Floor: vinyl tile or sheet vinyl
 - Walls: painted concrete block
 - Ceiling: painted drywall
- Wash and Shower Rooms
 - Floors: ceramic tile
 - Walls - ceramic tile full height
 - Ceilings: painted drywall

7. Special Equipment:

- 30 full size heavy duty lockers per change room. At least 4 must be accessible from a wheelchair.
- one hardwood bench per change room not fixed in a manner to restrict wheelchair access.
- one full length mirror per change room
- usual washroom accessories, partitions, etc.

8. Special Considerations:

- access to the shower rooms must be through the change rooms
- access to the change rooms must be through the gymnasium only. The

change room doors must be located so as to be easily viewed by the teacher monitoring the gym activities

4. Gym Offices

1. Activity: office and washroom space for gym teacher. Generally one per elementary gym and two per other gyms. See also specific school program.
2. Size: 150 SF
3. Cabinets: none required
4. Communications:
 - telephone
 - one dual LAN outlet
5. Electrical:
 - Power: two duplex outlets
 - Lighting: 70 foot candles
6. Finishes:
 - office:
 - Floor: vinyl tile or sheet vinyl
 - Walls: painted concrete block
 - Ceilings: acoustic tile
 - Washrooms
 - Floor: ceramic tile
 - Walls: ceramic tile full height in shower - minimum 4' high in balance of room
 - Ceiling: painted drywall
7. Special Equipment:
 - one tack board, 12 SF
 - usual washroom accessories
8. Special consideration: windows to gym to facilitate monitoring of gym and locker room entrances.
9. Mechanical:
 - one lavatory, one water closet and one shower (in a separate room connected to gym office)

5. Gym Storage:

1. Activity: storage and dispensing of gym equipment
2. Size: 1000 SF
3. Cabinets: none
4. Communications:
 - public address system
 - one dual LAN network outlet
5. Electrical:
 - Power: two duplex outlets

- Lighting: 50 foot candles\
- 6. Finishes:
 - Floor: vinyl tile
 - Walls: painted concrete block
 - Ceiling: exposed structure if permitted by code
- 7. Special Equipment:
 - Room divider - mesh partition to subdivide room in half, complete with
 - wire mesh door
 - dutch door with shelf to gym
- 6. Stage:
 - 1. Activity: presentations to large audiences.
 - 2. Size:
 - Elementary: 600 SF
 - Other: 1200 SF
 - 3. Cabinets: none required
 - 4. Communications:
 - public address system
 - one dual LAN network outlet
 - one internal broadcast outlet for TV system
 - sound system
 - assistive listening device for hearing impaired
 - 5. Electrical:
 - Power: for curtains and projection screen and five duplex outlets plus 100 amps for bands
 - Lighting: special stage lighting - see part 7.0 Electrical Outline
 - 6. Finishes:
 - Floor: softwood except 36" wide hardwood skirt facing performance area(s)
 - Walls: painted concrete block
 - Ceiling: exposed structure
 - 7. Special Equipment:
 - moveable walls if required by room layout
 - proscenium arch curtains(s), mechanically operated
 - one motorized projection screen
 - cyclorama (backdrop) curtains
 - under stage chair storage dollies
 - 8. Special consideration:
 - barrier free access
 - two means of egress
 - access is required from both sides of the stage (this can be achieved using portable stairs)

- moveable walls if required to suit layout (for example a stage facing two assembly areas)

7. Stage Storage:

1. Activity: storage of stage related items
2. Size: 400 SF (could be loft storage)
3. Cabinets: none required
4. Communications:
 - public address system
 - one dual LAN outlet
5. Electrical:
 - Power: three general purpose duplex outlets
 - Lighting: 50 foot candles
6. Finishes: as per gym storage
7. Special Equipment: double doors
8. Special consideration: adjacent to stage

8. Cafeteria:

1. Activity:
 - a place for the students to eat lunch
 - an assembly area for the school
 - a performance hall if a stage has been incorporated
 - a community assembly area
2. Size: See specific school program. The minimum size is ten square feet for one third of the student population.
 - the shape is critical if the cafeteria is to be used as a performance space. See music room description for shape criteria
3. Cabinets: none required
4. Communications:
 - public address system
 - one media retrieval
 - six dual LAN outlets including one for a multi media projector
 - assistive listening for hearing impaired
 - one TV outlet
 - one internal broadcast outlet for TV system
 - one sound system (if cafeteria is to be used as a performance area)
5. Electrical:
 - two duplex power outlets beside each dual LAN outlet
 - five duplex convenience outlets
 - power to projector, screen, etc.
 - Lighting: - 70 foot candles
 - able to be reduced in three stages
 - dimmable if a performance area

- indirect
- 6. Finishes: as per typical classroom plus fabric wall panels.
- 7. Acoustical:
 - consideration should be given to acoustically rated sheet flooring.
 - separation from adjacent spaces, minimum STC 48
 - sound level in unoccupied room 45 dBA. At least 35% of each available wall shall be covered with fabric wrapped acoustic panels
 - acoustic treatment of the ceiling is required
- 8. Special Equipment:
 - one overhead multi-media projector, ceiling-mounted
 - one overhead projection screen, electrically operated
 - room darkening: vertical blinds
- 9. Kitchen
 - 1. Activity: preparation of basic lunches
 - 2. Size: see specific school program
 - 3. Cabinets:
 - base and overhead cabinets as required to suit layout

Note: clearance requirements between combustible cabinets and range hoods, etc. must be maintained
 - 4. Communications:
 - telephone
 - one dual LAN outlet
 - 5. Electrical:
 - Power: as required for equipment and general convenience outlets
 - Lighting: 50 foot candles
 - 6. Finishes:
 - Floor: quarry tile
 - Walls: ceramic tile
 - Ceilings: painted drywall
 - 7. Special Equipment: See equipment in Section 8
 - 8. Mechanical:
 - cooking exhausts to meet NFPA 96 requirements.
 - plumbing: to suit equipment
 - provide a separate hand wash lavatory
 - provide a separate vegetable wash sink
- 10. Kitchen Storage:
 - 1. Activity: storage of food
 - 2. Size: minimum 120 SF
 - 3. Cabinets: none
 - 4. Communications: none
 - 5. Electrical:

- Power: no outlets required
- Lighting: 30 foot candles
- 6. Finishes:
 - Floor: quarry tile
 - Walls: ceramic tile
 - Ceilings: painted drywall
- 7. Special Equipment: floor to ceiling shelving to meet Department of Health standards
- 8. Special consideration:
 - a service door to the exterior is required from the kitchen, near the storage room
 - this door must be accessible by a light truck and must be remote from the main entry door
 - provision for discrete handling of garbage must be made

.11 Outside Storage:

- 1. Activity: storage of outdoor athletic equipment
- 2. Size: minimum 200 SF
- 3. Cabinets: none
- 4. Communications: none
- 5. Electrical:
 - Power: one duplex outlet
 - Lighting: 30 foot candles
- 6. Finishes:
 - Floor: painted concrete or concrete with a chemical hardener
 - Walls: painted concrete block
 - Ceilings: exposed structure where permitted by code
- 7. Special Equipment:
 - paved access at grade
- 8. Special consideration:
 - a double door to the exterior
 - protection against possible freezing of water and sprinkler pipes

3.7 ADMINISTRATION/STUDENT SERVICES

3.7.1 ADMINISTRATION:

1. Reception/General Office:

- 1. Activities: secretarial and reception services for school administration. Visual control of front entrance, main stairway and elevator.
- 2. Size: minimum 500 SF (larger if noted in specific school program)
- 3. Cabinets:
 - barrier free reception counter

- work stations for at least three staff (more if area is larger than 500 SF)
Note: these cabinets and work stations can be built-in or purchased)
 - 4. Communications:
 - main station for public address system
 - two dual LAN outlets per work station
 - one telephone per work station
 - one media retrieval outlet
 - one internal broadcast outlet for TV system
 - 5. Electrical:
 - Power: two duplex power outlets for each LAN data outlet plus 5 duplex convenience outlets
 - lighting: 70 foot candles able to be reduced to 33% or 66%
 - 6. Finishes:
 - Floor: carpet or resilient tile or resilient sheet flooring
 - Walls: painted concrete block or painted drywall
 - Ceilings: acoustic tile
 - 7. Acoustical:
 - separation between adjacent spaces STC 48
 - sound level in unoccupied room, 40 dBA
 - 8. Special Equipment
 - one tack board 4' x 4'
 - room darkening: vertical blinds
 - provision for reception seating
 - 9. Special Considerations
 - view to front lobby, bus drop off, and elevator
2. Principal's Office: same as Reception/General Office except as follows:
- 1. Activities:
 - School Administration
 - Meetings with up to six people
 - 2. Size: 140 SF
 - 3. Cabinets: None
 - 4. Communications:
 - one dual data LAN outlet
 - one telephone
 - 5. Electrical:
 - Power: two duplex power outlets beside the LAN outlet plus three convenience duplex outlets
 - lighting: 70 foot candles able to be reduced to 33% or 66%
 - 6. Special Considerations
 - views to bus loop, front door and playground where applicable

3. Vice Principal's Office: same as Principal's Office except if the Principal's Office views the front door the Vice Principal's Office need not.
4. Conference Room: same as Principal's Office except:
 - size minimum 180 SF will be larger if so designated in the specific school program
 - a small built-in counter is required, minimum 5' long
 - windows are desirable but optional
 - dimmable incandescent light fixtures are required in addition to the fluorescent lights
5. Storage/Photocopy
 1. Activities:
 - Storage of supplies
 - operation of photo copier
 2. Size: 100 SF
 3. Cabinets:
 - base cabinet minimum 8' long x 24" wide x 36" high with adjustable shelving and doors
 - wall cabinet 8' long x 36" high x 12" clear inside width. Adjustable shelving and doors
 - one row of floor to ceiling shelving, minimum 10' long with 6 adjustable shelves. Doors are not required.
 4. Communications:
 - one dual LAN network outlet
 - one telephone
 5. Electrical:
 - Power: two duplex outlets beside the LAN outlet plus two duplex convenience outlets plus power as required for the photocopier
 - Lighting: as per Reception/General Office
 6. Finishes: as per Reception/General Office
 7. Mechanical: exhaust: provide a dedicated exhaust over the photocopier
6. Sick Room: same as Reception/General Office except:
 1. Activities: a resting place for students who are temporarily ill.
 2. Size: 100 SF
 3. Cabinets: none
 4. Communications: one dual LAN outlet
 5. Electrical:
 - Power one duplex outlet
 6. Floor: vinyl composite tile or resilient sheet flooring
 7. Special Considerations: adjacent to a washroom
 8. Mechanical: one sink required

7. Washroom:
 1. Activity: self-explanatory
 2. Size: minimum 50 SF, barrier-free
 3. Cabinets: one vanity counter, barrier-free design
 4. Communications: one emergency cord
 5. Electrical: as required by code
 6. Finishes:
 - Floor: hard or soft tile
 - Walls: drywall
 - Ceiling - acoustic tile or drywall
 7. Acoustical: separation from adjacent occupancies, minimum STC 48
 8. Special Equipment: grab bars, mirrors, washroom accessories as required

3.7.2 STAFF ROOMS:

1. Staff Room
 1. Activities: staff gatherings
 2. Size: 800 SF minimum (larger if so designated in specific school program)
 3. Communications:
 - one telephone
 - five dual LAN outlets
 - public address system
 4. Electrical:
 - Power: two duplex outlets beside each dual LAN outlet plus seven convenience outlets.
 - Lighting: 70 foot candles able to be reduced by 33% and 66%
 5. Finishes: as per Reception/General Office
 6. Acoustic: as per Reception/General Office
 7. Special Equipment
 - two tack boards 4' x 4' each
 - room darkening vertical blinds
2. Staff Work Room:
 1. Activities: teachers preparing for class work
 2. Size: 400 SF minimum (larger if so designated in specific school program)
 3. Cabinets:
 - one base cabinet 36" high x 30" wide, minimum 10' long with adjustable shelving and doors
 - one upper cabinet 36" high x 12" clear inside width, minimum 10' long with adjustable shelving and doors
 4. Communications:
 - six dual LAN outlets, two on the counter, one in the floor and the balance along the perimeter of the room

- one intercom station
 - one telephone
 - media retrieval
5. Electrical:
- Power: two duplex outlets beside each LAN outlet plus three convenience outlets, plus power as required for a photocopier
 - Lighting: 70 foot candles able to be reduced by 33% and 66%
6. Finishes: as per Reception/General Office
7. Acoustical: as per Reception/General Office
8. Special Equipment
- two tack boards 4' x 4' each
 - room darkening vertical blinds
9. Mechanical: dedicated exhaust over the photo copier
3. Staff Kitchen:
1. Activities: making coffee and/or individual lunches.
 2. Size: 70 SF
 3. Cabinets:
 - base cabinet 7" x 6" long x 24" wide x 36" high with drawers, adjustable shelves and complete with one barrier-free sink.
 - wall cabinet 8' long x 30" high x 12' clear inside with adjustable shelving and lockable doors.
 4. Communications: none
 5. Electrical:
 - outlets as required by Code plus powered for appliances
 - Lighting: 50 foot candles
 6. Finishes: as per typical classroom
 7. Acoustical: as per Reception/General Office
 8. Special Equipment
 - microwave oven
 - built-in dish washer
 - 15 cu. ft. refrigerator
 9. Special Considerations: It must be possible to access the kitchen without travelling through the Staff Room or the Staff Work Room.
4. Coat Room:
1. Activities: self-explanatory
 2. Size: 100 SF
 3. Finishes: as per typical classroom
 4. Special Equipment: coat rails and hat shelf
 5. Special Considerations: it must be possible to access the coat room without travelling through the staff room or the staff work room.

5. Washroom: Identical to washroom for administration area except:
 1. Special Considerations:
 - two teacher's washrooms are required adjacent to the staff room.
 - other teacher's washrooms are required in the academic wings. At least one per every 16 classrooms, located to minimize the travel distance from classroom to washroom.
 - one washroom per wing is to be barrier-free
 2. Finishes:
 - Floors: ceramic tile
 - Walls: ceramic tile, half height

3.7.3 STUDENT SERVICES:

1. Guidance Room
 1. Activities:
 - meeting with councillors and students
 - display of promotional material
 - reception area for adjacent guidance offices
 2. Size: 400 SF
 3. Cabinets: as per typical classroom plus display shelving for magazine type material. Minimum four shelves high x 48" long.
 4. Communications:
 - two telephone
 - eight dual LAN outlets
 - public address system
 5. Electrical:
 - Power: two duplex outlets beside each dual LAN outlet plus three duplex convenience outlets
 - Lighting: 70 foot candles able to be reduced by 33% and 66%
 6. Finishes: as per Reception/General Office
 7. Acoustical: separation between adjacent occupancies 48 STC
 8. Special Equipment
 - three tack boards 4' x 4' each
 - room darkening vertical blinds
2. Guidance Office: as per Principal's Office except:
 1. Special Considerations: the guidance offices should be accessed through the guidance room so that there will be a guidance suite of rooms.
3. Records Storage Room: as per guidance office except:
 1. 100 SF
 2. A window is not required

4. Mediation: as per Guidance Office except:
 1. Activity: small group peer mediation
 2. Size: 120 SF
 3. Special Consideration: should be close to but not a part of the Guidance suite.
5. Itinerant Specialists: as per Guidance Office except:
 1. Activity: one on one consulting or small group meetings
 2. Size: 120 SF
 3. Special Considerations: these rooms should be in student services area of the building but need not be accessed through the guidance suite. If there are several other student services offices, access will be through a student services reception area.
6. Community Liaison Office: as per Itinerant Specialist except: 150 SF.
7. Teen Health: as per Community Liaison Office except: this is usually a suite consisting of one or two offices and a waiting area, separate from other rooms in the school, and able to be discretely entered.
8. Reception/Waiting Area: same as Community Liaison Office except this room should serve as an ante-room for the other student services rooms.

3.8 CIRCULATION:

3.8.1 LOBBY:

1. Activities:
 - welcoming people to the school
 - a display area
 - a gathering place
 - registration area for special events
2. Size: appropriate to the size of the school
3. Cabinets: a minimum of one large display cabinet
4. Communications:
 - two LAN outlets
 - intercom speakers
 - two telephones
 - media retrieval
 - one television outlet
 - provision for pay phone
 - one internal broadcast outlet for TV system
5. Electrical:
 - Power: two duplex outlets beside each LAN outlet plus three

convenience outlets as required

- Lighting: 50 foot candles in lobby plus separate lighting for display cabinet.

6. Finishes:

- Floor: quarry tile or equivalent
- Walls: a welcoming durable material in keeping with the importance of the front entrance of the school. Brick, tile, or other appropriate material
- Ceiling: acoustic tile or an architectural finish in keeping with the function of the Lobby

7. Acoustic: separation from adjacent occupancies, minimum 48 STC

8. Special Equipment

- several large tack boards to serve as display areas

3.8.2 CORRIDORS:

1. Activities:

- people movement
- gathering spaces
- small group discussion areas
- lockers and or coat hooks and benches

2. Size:

- as determined by code
- not less than 9' clear width for main corridors (net of lockers benches, etc.)

3. Cabinets: not required

4. Communications:

- LAN outlets must be available. Provide an average of at least one per 25' of corridor

- public address system

5. Electrical:

- Power: one duplex outlet beside each LAN outlet plus convenience outlets as required

- Lighting: 30 foot candles

6. Finishes:

- Floor: quarry tile wherever possible otherwise vinyl composite tile or resilient sheet flooring

- Walls: concrete block or abuse resistant drywall except where walls are concealed behind lockers. Behind lockers standard drywall as acceptable

- Ceiling: acoustic tile

7. Acoustical: separation from adjacent occupancies to meet requirements for specific rooms

8. Special Equipment

- an average of one 4 x 4 tack board per 100 feet of corridor

- one heavy duty locker per student for middle/junior and senior high schools
 - one coat hook per student for elementary schools. Provide hat shelves over coat hooks and benches under coat hooks. Coat hooks to be wood dowels minimum 1 1/2" diameter.
9. Mechanical:
- one refrigerated water cooler per corridor per floor, plus one close to gym

3.8.3 STAIRS

1. Activities:
 - movement of large groups of people from floor to floor
 - provision of "areas of refuge" as per the National Building Code of Canada
2. Size: as per National Building Code of Canada
3. Cabinets: None
4. Communications:
 - public address system
5. Electrical:
 - Power: convenience outlets only
 - Lighting: 30 foot candles
6. Finishes:
 - Floor: as per corridor except:
 - the main stair shall have hard tile floors and treads
 - other stairs: hard tile preferred.. Solid rubber nosings and treads are the minimum acceptable standard
7. Acoustic: as per corridors
8. Special Equipment
 - to meet National Building Code of Canada

3.8.4 ELEVATOR: must be full size elevators not wheelchair lifts. See Section 5 for more detail.

3.9 BUILDING SUPPORT SERVICES

3.9.1 STUDENT WASHROOMS

1. Activities: self-explanatory
2. Size: as per National Building Code of Canada
3. Cabinets: one vanity counter, wheelchair accessible
4. Communications:
 - public address system
5. Electrical:
 - convenience outlets only:

- Lighting: 30 foot candles
 - 6. Finishes:
 - Floor: quarry tile or ceramic tile
 - Walls: ceramic tile full height
 - Ceiling: painted drywall or acoustic tile
 - 7. Acoustic: separation from adjacent occupancies 48 STC
 - 8. Special Equipment:
 - mirrors, grab bars and other washroom accessories as required
 - the barrier-free stall must contain a shelf minimum size 18" x 36"
- Note: Doors are not required to student washrooms provided visual privacy can be obtained.

- 3.9.2 MAINTENANCE OFFICE:
 - 1. Activities: monitoring the building controls system
 - 2. Size: 120 SF
 - 3. Cabinets: not required.
 - 4. Communications:
 - two LAN network outlets
 - one telephone
 - public address system
 - 5. Electrical:
 - two duplex outlets beside each LAN outlet plus two convenience outlets
 - Lighting: 70 foot candles able to be reduced by 33% and 66%
 - 6. Finishes: as per typical classroom
 - 7. Acoustic: separation between adjacent spaces: STC 48
 - 8. Special Equipment: one tack board 4' x 4'.

- 3.9.3 BOILER ROOM:
 - 1. Activities: self evident
 - 2. Size: as required for equipment (refer to Section 6.0 Mechanical Outline)
 - 3. Communications: as required for equipment
 - 4. Electrical: as required for equipment
 - 5. Finishes:
 - Floor: minimum acceptable - chemically hardened concrete, sloped to drains
 - Walls: minimum acceptable - concrete block
 - Ceiling: as required by National Building Code of Canada
 - 6. Special Equipment: as required.
 - 7. Special Considerations:
 - The boiler room must be in a location remote from all learning, assembly and administration type areas in order to ensure that products of combustion cannot flow from the boiler room back into the school. A vestibule arrangement by itself is not satisfactory.

- Special care must be taken to make sure the air supply and exhaust are properly balanced. A negative air pressure in the room will starve the boilers and a positive pressure will tend to drive products of combustion into the remainder of the school.
- Special care must also be taken in the location of the chimney relative to the air intake louvres of the air handling systems.

3.9.4 SPRINKLER ROOMS: as per mechanical rooms except:

1. Special Considerations:
 - a separate room is required for sprinkler tanks (if required)

3.9.5 MECHANICAL ROOMS - Air Handling: as per Boiler Rooms except

1. Special Considerations:
 - air handling rooms cannot be located directly above learning or administration areas. Other rooms such as storage rooms must be utilized as acoustic buffers
 - the location of intake louvres relative to exhaust louvres and truck and bus exhausts and chimneys is critical.
 - adequate space must be provided for proper servicing of equipment, changing of filters, etc. The penalty for not providing adequate space is sure to be poor air quality.

3.9.6 ELECTRICAL ROOMS: as per Boiler rooms except walls can be drywall

1. Special Considerations:
 - underground electrical conduits have a tendency to funnel ground water into electrical rooms. Make sure that the pad mount transformer is not above the elevation of the floor of the electrical room
 - provide buffer rooms such as storage rooms between electrical rooms containing transformers and other occupancies

3.9.7 COMMUNICATION ROOMS: as per Electrical rooms

- communications rooms must be distributed throughout large buildings. The maximum length of cable runs is 300'.
- rooms containing LAN servers need a counter and work space for technicians
- ventilation is required for servers

3.9.8 STORAGE ROOMS:

1. Activities: Self evident
2. Size: minimum
 - general building 1000 SF
 - maintenance 400 SF
- Note: (larger if required in specific school program)
3. Cabinets: not applicable

4. Communications:
 - one LAN outlet
5. Electrical:
 - Power: one duplex outlet beside the LAN outlet plus five convenience outlets
 - Lighting: 30 foot candles
6. Finishes:
 - Floor: vinyl composite tile
 - Walls: painted block or drywall
 - Ceiling: as required by National Building Code of Canada
7. Special Equipment:
 - metal shelving to suit room, layout 5 shelves high minimum amount
 - general storage:
 - 50 lineal feet x 24" wide
 - 120 lineal feet x 18" wide
 - 60 lineal feet x 12" wide
 - maintenance storage:
 - 40 lineal feet x 24" wide
 - 80 lineal-feet x 18" wide
 - 40 lineal feet x 12" wide

3.9.9 RECYCLING ROOM

1. Activities: sorting and storage of recyclable material
2. Size: 150 SF
3. Cabinets: one counter 6' long with a large sink
4. Communications:
 - one dual LAN network outlet
 - one telephone
5. Electrical:
 - power: two duplex outlets
 - Lighting: 50 foot candles
6. Finishes:
 - Floor: quarry tile or ceramic tile
 - Walls: ceramic tile
 - Ceiling: painted drywall

3.9.10 JANITOR'S CLOSETS

1. Activity: storage of cleaning supplies, mops, etc.
2. Size: minimum 40 SF, one per floor is required
3. Special Equipment: one large slop sink

3.9.11 OIL TANK

This will be an above ground exterior tank. A permanent access stair or ladder is required for oil delivery. Fencing is required around the oil tank.

4.0 PERFORMANCE CRITERIA



4.0 PERFORMANCE CRITERIA

4.1 NOVA SCOTIA BUILDING CODE REGULATIONS will also provide minimum standards. Where anything in the School Design Requirements Manual exceeds the minimum standards of the Nova Scotia Building Code Regulations, the Manual shall become the minimum acceptable Standard.

4.2 NATIONAL BUILDING CODE OF CANADA (NBCC)

The latest edition of the NBCC will provide the minimum standards for the school. Where anything in this School Design Requirements Manual exceeds the minimum standards defined by the NBCC, the Manual shall be the minimum standard.

4.3 ENERGY

1. The requirements of the "Model National Energy Code of Canada" for Buildings 1997" shall be followed.
2. The requirements of this Code cover the building envelope, heating, ventilating, air-conditioning, service water heating, lighting, and provision of electrical power.
3. In no instance shall the Standard established by these documents be reduced by the application of any other codes.

4.4 LONGEVITY - the following longevity requirements will be the minimum standard of acceptance assuming normal maintenance and replacement of subsidiary components:

| | | |
|-----|---|-----------|
| 1. | Parking, walkways, ramps | 30 years |
| 2. | Lawns and Planting | 15 years |
| 3. | Building Structure | 100 years |
| 4. | Roofing | 20 years |
| 5. | Roof substrate components | 35 years |
| 6. | Exterior walls | 35 years |
| 7. | Foundations | 100 years |
| 8. | Sealants | 10 years |
| 9. | Fenestration, doors & openings | 35 years |
| 10. | Architectural Systems (other than floors/painting) | 15 years |
| 11. | Floor Finish | 10 years |
| 12. | Wall Finish | 5 years |
| 12. | Vertical Transportation | 35 years |
| 13. | Appliances | 15 years |
| 14. | Washroom Equipment | 15 years |

| | | |
|-----|-----------------------------------|----------|
| 15. | Plumbing Less Water Heating | 35 years |
| 16. | Ventilation Systems | 15 years |
| 17. | H/V delivery (other than ducting) | 15 years |
| 18. | Ducting | 35 years |
| 19. | Power (excluding lighting) | 35 years |
| 20. | Power distribution | 15 years |
| 21. | Lighting | 15 years |
| 22. | Building Automation | 15 years |
| 23. | Equipment | 5 years |

4.5 YEAR 2000 COMPLIANCE

All systems in Schools shall conform to the Nova Scotia Year 2000 Certification/Definition of Compliance as issued by the Nova Scotia Technology and Science Secretariat, latest issue.



5.0 ARCHITECTURAL OUTLINE



5.0 ARCHITECTURAL OUTLINE

Introduction

This section is not intended to be a complete Architectural specification for a school project. Such a complete specification must be written for each project by the Project Architect.

This section does specify outline form the minimum acceptable standards for the architectural components of the school.

5.1 GENERAL

5.1.1 GENERAL BUILDING REQUIREMENTS

.1 Foundation and Structure

- .1** The foundation system shall be established in the light of the recommendations of the geotechnical report.
- .2** Foundation and floor slabs to be of reinforced concrete construction designed by a structural engineer licensed to practice in the Province of Nova Scotia.

.2 Structural Systems

- .1** Structural systems shall be structural steel, reinforced concrete or load bearing masonry.
- .2** Wood framing will not be acceptable except as follows:
 - .1** Wood trusses for sloped roofs only
 - .2** Heavy timber construction
 - .3** Prefabricated laminated wood post and beam systems with tongue and groove wood decks
- .3** All structural systems shall be designed by an engineer licensed to practice in the Province of Nova Scotia, all to meet the requirements of this manual.

.3 Exterior Walls

- .1** Acceptable materials for exterior walls are:

- .1** Clay brick
- .2** Precast or tilt-up concrete

.3 Metal panels for walls higher than 12' above finished grade

Note: This manual provides an outline specification for a masonry wall system (Section 5.4) Should precast concrete, tilt-up concrete or metal wall systems be proposed, be prepared to demonstrate that these systems meet or exceed all the requirements of the specified masonry system.

- .2** Exterior wall design to be a "rainscreen" principle providing a pressure-equalized cavity between the exterior cladding and the air barrier.
- .3** Size and locate vents in the exterior wythe to achieve "nearly instantaneous" pressure equalization of the cavity and protect from rain entry.

.4 Roofing Systems

- .1** Acceptable systems are:
 - .1** Modified bitumen

- .2 Single ply EPDM
 - .3 Asphalt shingles
 - .2 This Manual provides an outline specification (Section 5.7) for a modified bitumen roofing system. Should an EPDM or Asphalt shingle roofing system be proposed, be prepared to demonstrate that it meets or exceeds all of the requirements of the specified modified bitumen system.
 - .3 The roof membrane being the principal air barrier on the roof shall have all penetrations carefully detailed and components specified.
- .5 Insulation and Air/Vapour Barriers
- .1 Provide building envelopes that will effectively and efficiently separate the interior from the exterior environment by controlling the movement of air (not more than 0.1 L/S per m² at 75 Pa) water, heat and water vapour using assemblies that are practical, constructible and economical and that will minimize operating and maintenance life cycle costs.
 - .2 Provide building insulation to completely enclose the non-cladding parts of the structure.
 - .1 Perimeter Foundation Insulation:
 - .1 To 24" below finish grade on inside face of perimeter foundation walls.
 - .2 To 24" in from perimeter foundation wall under slabs on grade.
 - .3 2" thick expanded polystyrene type 2 or extruded polystyrene type 4.
 - .2 Cavity Wall: extruded polystyrene to CAN 2-51.20, minimum R value 10.
 - .3 Roof: Extruded/Expanded polystyrene to CGSB 51.20M, or fibrous glass insulation to CGSB 51.25-M87, or isocyanurae (urethane) insulation to CGSB 51.26M, minimum R value 20.
 - .3 Place air/vapour barrier on the warm side of the insulation.
 - .4 Place the warm side of the insulation in direct contact with the air barrier.
 - .5 Ensure that the air barrier is capable of maintaining its continuity and its contact with the insulation under all expected loading conditions.
 - .6 Prepare large scale details (minimum 1/2 full size) to show how air barrier continuity is maintained at window surrounds, roof and wall junctions, envelope penetrations and changes of substrate materials.

- .7 Design and detail the building envelope so that water cannot stand on any surface, and ice formation on the face of the building is minimized.
- .8 Design exterior walls to incorporate a continuous air barrier that is located on as flat and plane a surface as possible to provide as air tight a wall system as is practical.
- .9 Consider building occupation, particularly humidity requirements, and "state of the art" construction as major influences in the choice of a wall system.
- .10 Design exterior walls so that any moisture in the wall that is on the cold side of the vapour barrier can be dissipated to the outside atmosphere.
- .11 Design masonry veneered exterior walls so that there is a minimum 50 mm air space between the insulation and the veneer material. Provide baffles in air space to compartmentalize the cavity into zones of equal pressure.
- .12 Eliminate thermal bridges. Design walls so that condensation does not occur and air/vapour barrier continuity is maintained.
- .13 At roof to wall junctions, the roof membrane shall be brought at least 300 mm up the wall. Construction sequence of the wall shall not interfere with the continuous operation of the roofing work.
- .14 Design and locate air/vapour barrier for overhangs and hidden spaces in envelope so that condensation will not occur in these spaces. Consider air/vapour barrier continuity and build-ability, insulation location, thermal bridging and air circulation in order to determine if space will perform better as cold exterior or warm interior space.

.6 Jurisdictional Authorities

- .1 Where reference is made to jurisdictional authorities, it shall mean all authorities who have within their constituted powers the right to enforce the laws of the place of building.

.7 Reference Standards

- .1 Where edition date is not specified, consider that references to manufacturer's and, published codes, standards and specifications are made to the latest edition, or revision approved by the issuing organization, current at the date of this Specification.
- .2 Reference standards and specifications are quoted in this Specification to establish minimum standards. Work which in quality exceeds these minimum standards shall be considered to conform.
- .3 Where reference is made to manufacturer's directions, instructions

or specifications they shall include full information on storing, handling, preparing, mixing, installing, erecting, applying, or other matters concerning the materials pertinent to their use and their relationship to materials with which they are incorporated.

- .4 Have a copy of each code, standard and specification, and manufacturer's directions, instructions and specifications, to which reference is made in this Specification, always available at construction site.
- .5 Standards, specifications, associations, and regulatory bodies are generally referred to throughout the manual by their abbreviated designations.

They are:

| | | |
|--------|---|---|
| AA | - | The Aluminum Association |
| AABC | - | Associated Air Balance Council |
| ACI | - | American Concrete Institute |
| AISI | - | American Iron and Steel Institute |
| AMCA | - | Air Moving & Air Conditioning Assoc. |
| ANSI | - | American National Standards Institute |
| ARI | - | Air Conditioning & Refrigeration Institute |
| ASTM | - | American Society for Testing and Materials |
| ASHRAE | - | American Society of Heating, Refrigeration & Air Conditioning Engineers, Inc. |
| AWI | - | Architectural Woodwork Institute |
| AWMAC | - | Architectural Woodwork Manufacturers Association of Canada |
| CGSB | - | Canadian General Standards Board |
| CISC | - | Canadian Institute of Steel Construction |
| CPMA | - | Canadian Paint Manufacturers Association |
| CSA | - | Canadian Standards Association |
| TPW | - | N.S. Department of Transportation & Public Works |
| IAO | - | Insurers Advisory Organization |
| MFMA | - | Maple Flooring Manufacturers Association |
| NAMM | - | The National Association of Architectural Metal Manufacturers |
| NBC | - | National Building Code |
| NFPA | - | National Fire Protection Association |
| NRC | - | National Research Council, Canada |
| SAE | - | Society of Automotive Engineers |
| SMACNA | - | Sheet Metal & Air-Conditioning Contractors National Association Inc. |
| ULC | - | Underwriters Laboratories of Canada |
| ULI | - | Underwriters Laboratories Incorporated |

.8 CSA Approval: all equipment installed in schools will be CSA approved.

5.2 SITE DEVELOPMENT

5.2.1 GENERAL

.1 Geotechnical Studies

- .1 Provide a detailed soil investigation at the building site, on the sports field, in the playground areas and, at any other location which may require a special foundation. Soils investigation to be done by a professional engineer licensed to practice in Nova Scotia and with at least 10 years experience in soils engineering.
- .2 The number of holes shall be sufficient to provide accurate information concerning the prevailing soil, rock and ground water conditions at the proposed site. This data shall allow the Engineer to provide accurate recommendations with respect to foundation design and construction for the proposed structures.
- .3 The written report shall be prepared and signed by a Soils Engineer and will include:
 - .1 The logs and the results of all the in-situ and laboratory tests.
 - .2 A location plan showing, the proposed building layout.
 - .3 A brief description of the field procedure and equipment used.
 - .4 A description of the site and of all the encountered soil and rock layers.
 - .5 Recommendations on the design and construction of the foundations of the proposed buildings and of any ancillary structures, i.e., access roads, parking lots, sports fields, etc.
- .4 The recommendations shall include the following items:
 - .1 Types of foundations with justifications of the choice.
 - .2 For shallow foundations: soil bearing capacity and settlement evaluation.
 - .3 For pile foundations: possible or recommended types, approximate pile tip elevation, design parameters for friction piles, negative friction evaluation if applicable.
 - .4 Temporary and long-term drainage requirements.
 - .5 Possibility of carrying slabs on grade.
 - .6 Temporary excavation.
 - .7 Design parameters for supported excavations, if applicable.
 - .8 Type of materials and degree of compaction for backfill.

5.2.2 ACCEPTABLE STANDARDS FOR SITWORKS

- .1 General:
 - .1 "Geometric Design Standards for Canadian Roads and Streets" - Roads and Transportation Association of Canada.
 - .2 Design shall meet all local requirements.
- .2 Landscaping:
 - .1 Retain as many trees on site as is feasible.
 - .2 Assure plant materials for landscape development are suitable for the locality.
 - .3 Do not plant under building overhangs or within 3'-0" of foundations.
- .3 Foundation:
 - .1 The thickness of the foundation for paved areas shall be determined while taking into account the results of the soils tests, the properties of the foundation materials, the traffic type and frequency and the pavement thickness.
 - .2 The grading of the aggregates shall be such that it shall allow sufficient draining of the foundation, towards the storm drains while protecting against infiltration by fine subgrade materials.
 - .3 All of the aggregate layers shall be compacted at least 90% modified proctor density. Where required subgrade materials will be compacted in accordance with recommendations of soils consultant.
- .4 Asphalt Paving:
 - .1 Asphalt paving shall be applied to all the parking areas, in addition to the access lanes and loading areas.
 - .2 In no case shall the slope or finish profile of the finished pavement be less than 1%. The slope of paved ramps and loading areas shall not be greater than 6%.
 - .3 The thickness of the asphalt pavement will be 2 1/2" minimum in areas used by light traffic (vehicles of 1 ton or less) and 3" minimum for areas used by heavier vehicles, buses and trucks.
 - .4 The materials, mixes, compacting and laying of pavement shall conform to the specifications set out by the Department of Transportation and Public Works of the Province of Nova Scotia for asphalt paving.
 - .5 The parking areas and service areas shall be sloped for surface drainage to open ditches unless a municipal storm drainage system exists.
- .5 Sidewalks and Curbs:
 - .1 All sidewalks and curbs shall be concrete.

- .2 All of the sidewalks and the concrete curbs shall be laid on a granular foundation.
 - .3 The sidewalks and curbs will be on a 19mm (3/4") granular foundation. In the case of sidewalks integrated with a curb, the foundation shall extend 10 cm (4") beyond the exterior face of the curb. The foundation of the curbs shall be 46 cm (18") wide.
 - .4 At driveways, the sidewalk or curb will be lowered to allow the vehicles to pass.
 - .5 Provide lowered curbs as required to ensure proper barrier-free accesses.
 - .6 Expansion and contraction joints shall be built at right angles to the sidewalk.
 - .7 The expansion joints shall be made of 12 mm piece of wood or asphalt felt laid at 15 m (50') intervals, and possibly less at critical places such as near utility poles, fire hydrants, drains, etc.
 - .8 The surfaces of concrete sidewalks and curbs shall have a wood trowel finish. The surface shall be non-slip. All of the sidewalks shall be constructed to ensure a transverse slope of 3%.
 - .9 After finishing, polishing and cleaning up of edges, curing in accordance with CSA A23 shall be undertaken.
- .6 Sodding/Seeding/Planting:
- .1 All areas which are not paved left in a natural condition or occupied by structures shall be seeded or sodded.
 - .2 Sod Playfield and all areas within 20' of building.
 - .3 Provide a layer of improved organic soil at least 4" deep.
- .7 Excavation:
- .1 All organic soil shall be removed from the surface to be occupied by the buildings, roads, walks and parking areas. An adequate quantity shall be stockpiled for reuse in landscaping work.
 - .2 The depth of the excavation for the foundation walls and pilasters shall conform to the requirements of the codes and regulations. When subject to freezing, foundations shall not be less than 1.4 m (4'-0") below finished grade.
 - .3 Under all slabs on-grade, trenches and sidewalks, the backfill shall be composed of granular material of non capillary characteristics and compacted to 95% modified proctor. This layer of granular material shall have thickness of not less than 200 mm. When clay soil is under the area to be backfilled, a 150 mm layer of sand or fine gravel or specially made filters shall be placed before the layer of granular material is laid down. Granular material should be used for backfilling of the inside of the walls and pilasters.
 - .4 Where a high water table is expected under slabs on grade below ground level, a drainage system shall be installed in order to avoid

any hydrostatic pressure under the slabs. It shall consist of perforated pipes draining into a storm sewer system or into a sump. These drains shall be in and surrounded by a bed of granular material. Whenever possible, this system shall drain by gravity.

5.2.3 EARTHWORK

- .1 Tests and Inspections
 - .1 Do not begin backfilling or filling operations until material has been approved for use by the Soils Engineer.
 - .2 Not later than 48 h before backfilling or filling with approved material, notify Soils Engineer so that compaction tests can be carried out by the designated testing agency.
- .2 Performance
 - .1 Perform all aspects of earthwork to the satisfaction of the Soils Engineer. Provide written confirmation of acceptance from the Soils Engineer.

5.2.4 ASPHALT CONCRETE PAVEMENT

- .1 Quality Assurance
 - .1 Obtain and submit certificates from asphalt suppliers attesting that materials comply with specifications upon request.
 - .2 Submit affidavits that fill materials placed under Work of this Section have been compacted to specified density and approved by the soils consultant.
- .2 References
 - .1 ASTM C88-90, Test Method for Soundness of Aggregates by Use of Sodium Sulphate or Magnesium Sulphate.
 - .2 ASTM C117-90, Test Method for Material Finer Than 0.075 mm Sieve in Mineral Aggregates by Washing.
 - .3 ASTM C123-83(1990), Test Method for Lightweight Pieces in Aggregate.
 - .4 ASTM C127-88, Test Method for Specific Gravity and Absorption of Coarse Aggregate.
 - .5 ASTM C128-88, Test Method for Specific Gravity and Absorption of Fine Aggregate.
 - .6 ASTM C131-89, Test Method for Resistance to Degradation of Small Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
 - .7 ASTM C136-84a, Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .8 ASTM D698-91, Test Method for Laboratory Compaction

- .9 Characteristics of Soil Using Standard Effort (600 kN-m/m³).
.10 ASTM D995-88, Specification for Requirements for Mixing Plants for Hot-Mixed, Hot-Laid Bituminous Paving Mixtures.
.10 ASTM D1559-89, Test Method for Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus.
.11 ASTM D2419-91, Test Method for Sand Equivalent Value of Soils and Fine Aggregate.
.12 ASTM D3203-91, Test Method for Percent Air Voids in Compacted Dense and Open Bituminous Paving Mixtures.
.13 ASTM D4318-84, Test Method for Liquid Limit, Plastic Limit and Plasticity Index of Soils.
.14 ASTM D4791-89, Test Method for Flat or Elongated Particles in Coarse Aggregate.
.15 CAN/CGSB-8.1-88, Sieves Testing, Woven Wire.
.16 CAN/CGSB-8.2-M88, Sieves Testing, Woven Wire, Metric.
.17 CAN/CGSB-16.1-M89, Cutback Asphalts for Road Purposes.
.18 CAN/CGSB-16.2-M89, Emulsified Asphalts, Anionic Type, for Road Purposes.
.19 CAN/CGSB-16.3-M90, Asphalt Cements for Road Purposes.
.20 Asphalt Institute MS-2-88, Mix Design Method for Asphalt Concrete.
- .3 Materials
- .1 Tack Coat: to meet specified requirements of Nova Scotia Department of Transportation and Public Works Standard Specification, Division 4, Section 1 for emulsified asphalt.
.2 Bituminous Paving: to Nova Scotia Department of Transportation and Public Works Specification, Division 4 - Asphaltic Materials, Section 4 - Hot Laid Dense Graded Asphaltic Concrete Mixture "B". Asphalt of 200 to 300 penetration shall be used.
- .3 Granular Base Course:
- .1 Sub-Base: 6" of Type 2 compacted to 98% Standard Proctor Density.
.2 Base Course: 3" of Type 1 compacted to 98% Standard Proctor Density.
- .4 Line Marking Paint: Traffic line marking paint by PPG or C.I.L. Colour: Yellow, except handicapped area markings shall be blue.
- .4 Installation
- .1 Base Courses: Spread base courses aggregate in 3" layers and shape accurately, finish by blading and roll to cross section and profile required by Drawings and Specifications. Use 10 ton steel-wheeled roller. Shape base course at edges of pavement to allow for thickened asphaltic concrete edge band.
.2 Bituminous Paving: Apply bituminous paving to all areas shown on

the drawings, when outside temperature is not less than 40 deg. F. Lay mixture only on dry bases from which foreign matter has been removed. Spread evenly and roll to a final completed thickness of not less than 2 1/2" except 3" on surfaces to carry bus and truck traffic, all in accordance with N.S. Department of Transportation and Public Works Spec., Division 4 - Asphaltic Materials, Section 4 - Hot Mix, Hot Laid, Dense Graded Asphaltic Concrete "Placing Asphalt Mixture". The Work shall be done in strict accordance with the Department of Transportation and Public Works Specifications as stated above.

- .3 Levelling: Build up with surfacing and seal material all hollows and low spots found to retain water, until a uniform grade is achieved. Feather edges of built up areas evenly and uniformly to meet previously installed paving.
- .4 Joints In Pavement:
 - .1 Make transverse and longitudinal joints, and joints between new and old work, precisely and carefully.
 - .2 Make joints by keying or butting and bond them well.
 - .3 Ensure that a bond is provided between new and old pavements, or between work of successive days, by cutting through full depth of older course to expose a clean vertical surface, clean and remove loose or broken material from vertical surface, and paint it with tack coat. Place hot mixture of new pavement against joint and rake to required depth and grade.
- .5 Line Painting: Apply two coats of line marking paint for parking stall lines, 4" wide.

5.2.5 SITE SERVICES

- .1 Reference Standards
 - .1 Halifax Regional Municipality, Engineering & Works Department Standards for site servicing.
 - .2 Standard specification for Municipal Services - NSRBA and NSCEA.
- .2 Quality Assurance
 - .1 Requirements of Regulatory Agencies:
 - .1 Give necessary notices, obtain permits, pay for fees and furnish certificates as evidence that the Work as installed conforms with the laws and regulations of governing authorities.

- .2 Determine detailed requirements of jurisdictional authorities and conform to those requirements.
- .3 Submittals
- .1 As-built Drawings:
- .1 On completion of Work, of this Section, submit one set of "as-built" drawings, showing exact locations of service lines, tanks, disposal beds, manholes and catch basins, top and invert elevations at service lines and manholes.
- .4 Permits and Fees
- .1 Apply and pay for all permits, fees and inspections required from the authorities having jurisdiction on each service system. Comply with all by-laws, codes and regulations.
- .5 On-Site Sewage Disposal Systems
- .1 If required shall be designed, inspected and approved by an engineer licenced to practice in the Province of Nova Scotia and experienced in such work.
- .6 Materials
- .1 Sewage Piping:
- .1 Generally: Rigid polyvinyl chloride (PVC) pipe, push on joints conforming to the CSA B137.3-M90, including lubricant standard cast iron, mechanical joint fittings, complete with glands, rubber gaskets, nuts and bolts.
OR
- .2 Concrete Pipe and Fittings: 6"-10" diameter, non-reinforced concrete, over 10", reinforced concrete extra strength, rubber gasket joints to ASTM C14 and CSA A257-01 as manufactured by L.E. Shaw Ltd. Rubber gaskets for concrete pipe to ASTM C443 and CSA A257-3.
- .2 Water Supply Lines
- .1 Ductile iron cement mortar lined to AWWA C151 Class 52 minimum with mortar lined fittings having minimum pressure rating of 1035 kPa to AWWA C110. Cement mortar lining to AWWA C104.
- .2 Gate Valves:
- .1 Buried to: AWWA C500, minimum pressure rating 1025 kPa, minimum working pressure rating 1380 kPa and as follows:
- .1 Body: cast-iron with mechanical joint ends.
- .2 Mechanism (AWWA C500): bronze mount

- .3 solid wedge or double disc gates, non-rise spindle, and O-ring seals.
- .3 Mechanism (AWWA C509): wedge disc resilient rubber seat ring and machined seating surface, non-rising spindle, and O-ring seals.
- .4 Direction of opening: counter-clockwise.
- .5 Operating nut: 50 mm square.
- .6 Provide centering disc.
- .7 Supply one key of appropriate length operator valves.
- .3 Valve Boxes: to AWWA C500 and as follows:
 - .1 Cast-iron, slide type, adjustable for depth of pipe below finished grade.
 - .2 Covers marked "Water".
 - .3 Lugged to prevent turning and rolling of cover, and cover notched to suit.
- .4 Concrete for thrust blocks, encasement, cradles and supports: to meet the requirements of 5.3 Concrete.
- .5 Disinfectant: sodium hypochlorite or calcium hypochlorite to AWWA B300 or liquid chlorine to AWWA B301.
- .3 Culverts: Plain, galvanized corrugated steel pipe, conforming to Corrugated Steel Pipe Institute Specification No. 501-78, complete with coupling bands, bolts and end flares as detailed, all to Department of Transportation and Public Works' approval.
- .4 Precast Manholes: Reinforced concrete sections to ASTM C478. Provide sections with closed cell neoprene gaskets conforming to ASTM C443. Sizes as indicated on drawings, as manufactured by L.E. Shaw Ltd., Borchardt Concrete Products Ltd. or Gorden Shaw Concrete Products.
- .5 Precast Catch Basins: Reinforced concrete units conforming to same specifications as for manholes. Sizes as indicated on drawings, as manufactured by L.E. Shaw Ltd., Borchardt Concrete Products Ltd. or Gorden Shaw Concrete Products.
- .6 Manhole Frame and Cover: IMP Group Ltd. Type No. R10 or L.E. Shaw Model 5405-15.
- .7 Catch Basin Frame and Cover: IMP Group Ltd. Type No. R11 or L.E. Shaw Model 5405-35W.
- .8 Manhole Ladder: IMP Group Ltd. Type No. L1 in lengths to suit.
- .9 Pipe Bedding: To meet specified requirements of Reference Standards.
- .10 Concrete
 - .1 To meet specified requirements of 5.3 Concrete.

.2 **Bases and Aprons for Manholes and Catch Basins:** 3,000 psi compressive strength for bases and 5,000 psi for aprons after 28 days. Air entraining admixture to ASTM C260-66T. Air content of concrete 5% to 7%. Reinforcing steel of yield stress Grade 50 20,000 psi.

.7 **Installation**

.1 **Pipe Laying:**

- .1 Handle, lay, bed, join and cover pipes carefully and in such a manner as to preclude any possibility of damage thereto.
- .2 Lay and join pipes in strict accordance with written manufacturer's instructions and generally as follows:
 - in straight lines and to required even grades
 - clean pipe thoroughly before laying and protect from dirt and water infiltration.
 - support pipe on Class B bedding, if not shown or noted otherwise. Provide suitable pockets for the bells or coupling of pipe, so that the total length of the bottom segment of the pipe barrel is evenly and firmly supported.
Where pipes enter or leave manhole or other structure, support them on compacted crushed stone bed or concrete cradle through the backfilled area.
The pipe support shall extend laterally from undisturbed soil to the face of the wall through which the pipes pass.
- .2 Install PVC plastic pipe, and corrugated steel pipe in strict accordance with manufacturer's written instructions.
- .3 Face bell ends of water pipe in direction of laying. On grades 5% or greater lay pipe up grade. Do not exceed maximum joint deflection recommended by manufacturer. Deflect only after joint is completed.
- .4 Prevent entry of bedding material, water or other foreign matter into pipe. Use temporary water-tight heads when pipe laying is not in progress.
- .5 Install gaskets in accordance with manufacturer's instructions. During cold weather store gaskets in heated area to assure flexibility.
- .6 Install concrete pipe in accordance with AWWA M.9 manual for concrete pipe installation, where applicable.
- .7 Form concrete benching in manholes to provide a smooth unobstructed flow channel in the bottom of manhole with slopes of 8%.

- .8 **Valves and Valve Boxes**
 - .1 On direct buried valves, install valve boxes plumb and centered over operating nut, using centering disc, and true to line and grade.
- .9 **Testing**
 - .1 Test pipes as required by authorities having jurisdiction.
- .10 **Flushing and Disinfection**
 - .1 Flush and disinfect watermains to AWWA C651.
- .11 **Site Sewage Disposal System (where applicable)**
 - .1 Install in complete accordance with Engineer's instructions.

5.3 CONCRETE

5.3.1 CAST-IN-PLACE CONCRETE

- .1 **Design**
 - .1 All concrete work shall be designed by a Structural Engineer licensed to practice in the Province of Nova Scotia.
 - .2 Footings, foundations, slabs on grade and retaining walls to be designed to satisfy the necessary requirements of subsurface soils conditions as indicated by the investigation and report of a qualified Soils Engineer.
- .2 **References:**
 - .1 CAN/CSA-S269.3-M92, Concrete Formwork.
 - .2 CAN/CSA-G30.18 M92, Billet-Steel Bars for Concrete Reinforcement.
 - .3 Manual of Standard Practice - Reinforcing Steel Institute of Ontario.
 - .4 CAN/CGSB-37.2-M88, Emulsified Asphalt, Mineral Colloid-Type, Unfilled, for Dampproofing and Waterproofing and for Roof Coatings.
 - .5 CAN/CGSB-51.34-M86, Vapour Barrier, Polyethylene Sheet for Use in Building Construction.
 - .6 CAN/CSA-A5-93, Portland Cement.
 - .7 CAN/CSA-A23.1-M94, Concrete Materials and Methods of Concrete Construction.
 - .8 CAN/CSA-A23.2-M94, Methods of Test for Concrete.
 - .9 CAN/CSA-A23.5-M86(R1992), Supplementary Cementing Materials.
 - .10 CAN3-A266.1-M78, Air-Entraining Admixtures for Concrete.

- .11 CAN3-A266.2-M78, Chemical Admixtures for Concrete.
 - .12 CAN3-A266.4-M78, Guidelines for the Use of Admixtures in Concrete.
 - .13 CAN/CSA A363-M88, Cementitious Hydraulic Slag.
- .3 Quality Assurance
- .1 Have all concrete produced and delivered by a ready-mix plant that is a member of the Atlantic Provinces Ready Mixed Concrete Association (APRMCA) and holds a current "Certificate of Ready Mixed Concrete Production Facilities" issued by the Association.
- .4 Materials
- .1 Formwork materials:
 - .1 For concrete without special architectural features, use plywood and wood formwork materials to CSA-O121, CAN/CSA-O86.1, CSA-O153.
 - .2 For concrete with special architectural features, use formwork materials to CAN/CSA-A23.1.
 - .2 Form ties:
 - .1 Removable or snap-off metal ties, fixed or adjustable length, free of devices leaving holes larger than 25 mm dia. in concrete surface.
 - .3 Form release agent: chemically active release agents containing compounds that react with free lime in concrete resulting in water insoluble soaps.
 - .4 Form stripping agent: colourless mineral oil, free of kerosene, with viscosity between 70 and 110 s Saybolt Universal at 40°C, flashpoint minimum 150°C, open cup.
 - .5 Reinforcing steel: billet steel, grade 400, deformed bars to CAN/CSA-G30.18, unless indicated otherwise.
 - .6 Cold-drawn annealed steel wire ties: to CSA G30.3.
 - .7 Welded steel wire fabric: to CSA G30.5.
 - .8 Chairs, bolsters, bar supports, spacers: to CAN/CSA-A23.1.
 - .9 Portland cement: to CAN/CSA-A5.
 - .10 Supplementary cementing materials: to CAN/CSA-A23.5.
 - .11 Cementitious hydraulic slag: to CAN/CSA-A363.
 - .12 Water: to CAN/CSA-A23.1.
 - .13 Aggregates: to CAN/CSA-A23.1. Coarse aggregates to be normal density.
 - .14 Air entraining admixture: to CAN3-A266.1.
 - .15 Chemical admixtures: to CAN3-A266.2.
 - .16 Non premixed dry pack grout: composition of non metallic aggregate Portland cement with sufficient water for the mixture to

- .17 retain its shape when made into a ball by hand and capable of developing compressive strength of 35 MPa at 7 days.
- .17 Curing compound: to CAN/CSA-A23.1 white and to ASTM C309, Type 1-chlorinated rubber.
- .18 Premoulded joint fillers:
 - .1 Bituminous impregnated fiber board: to ASTM D1751.
 - .2 Sponge rubber: to ASTM D1752, Type I, flexible grade.
- .19 Weep hole tubes: plastic.
- .20 Damproof membrane:
 - .1 Kraft/polyethylene membrane:
 - .1 Plain: 10 mil thick polyethylene film bonded to asphalt treated creped kraft.
 - .2 Reinforced: two 75mm thick polyethylene films bonded each side of asphalt treated creped kraft paper, reinforced with 13 x 13 mm fibreglass scrim.
 - .2 Membrane adhesive: as recommended by membrane manufacturer.
- .21 Damproofing:
 - .1 Emulsified asphalt, mineral colloid type, unfilled: to CAN/CGSB-37.2, and to Section 07160 - Bituminous Damproofing.
- .22 Polyethylene film: 6 mil thickness to CAN/CGSB-51.34.

.5 Mixes

- .1 Proportion normal density concrete in accordance with CAN/CSA-A23.1, Alternative 1 to give following quality for concrete.
 - .1 Cement: Type 10 Portland cement.
 - .2 Minimum compressive strength at 28 days: 27.58 MPa
 - .4 Class of exposure: C-2.
 - .5 Nominal size of coarse aggregate: 20 mm.
 - .6 Slump at time and point of discharge: 20 to 40 mm.
 - .7 Air content: 5 to 8%.
 - .8 Chemical admixtures: following admixtures in accordance with CAN3-A266.4, type, quantity, water reducing strength increasing.

.6 Construction

- .1 Do cast-in-place concrete work in accordance with CAN/CSA-A23.1.
- .2 Finishing
 - .1 Finish concrete in accordance with CAN/CSA-A23.1.
 - .2 Use curing compounds compatible with applied finish on

- .3 concrete surfaces.
- .3 Finish concrete floor to meet requirements of CGSB 81-GP-1M.
- .4 Rub exposed sharp edges of concrete with carborundum to produce 3 mm radius edges unless otherwise indicated.
- .3 Damproof membrane.
 - .1 Install dampproof membrane under concrete slabs-on-grade inside building.
 - .2 Lap dampproof membrane minimum 150 mm at joints and seal.
 - .3 Seal punctures in dampproof membrane before placing concrete. Use patching material at least 150 mm larger than puncture and seal.
- .7 Site Tolerance
 - .1 concrete tolerance in accordance with CAN/CSA-A23.1 straight edge method.
- .8 Field Quality Control
 - .1 Provide inspection and testing of concrete and concrete materials in accordance with CAN/CSA-A23.1.
- .9 Admixtures
 - .1 All exterior exposed concrete, such as walks, curbs, steps and landings shall have an approved air entraining agent (ASTM) added to the mix to bring the total air content to 5% plus or minus 1%.
- .10 Curing Material
 - .1 Curing compound for all concrete floor areas, except those which are to receive seamless flooring, epoxy or latex coatings, or quarry tile cured using CGSB Spec. 90-GP-1a or equal.
- .11 Formwork Materials
 - .1 Use form materials to CSA Spec. CAN3 A23.1-M94.
 - .2 For form coating, use a non-staining form coating.
- .12 Formwork Installation
- .13 Concrete adequately strong and leakproof formwork to CAN3-A23.1-M94.
- .14 GROUTING
 - .1 Grout all construction joints concrete to concrete, concrete to steel.

5.4 MASONRY

5.4.1 MASONRY PROCEDURES

.1 Reference Standard

- .1** Do masonry work in accordance with CAN3-S304-M78 and CSA-SA-78-95 except where specified otherwise.

.2 Cold Weather Requirements

- .1** When air temperature is below 5 deg. C, take following precautions in preparing and using mortar:
 - .1** Heat sand slowly and evenly. Do not use scorched sand, having a reddish cast, in mortar.
 - .2** Heat water to 70 deg.C maximum; 20 deg C minimum.
 - .3** After combining heated ingredients maintain temperature of mortar between 5 deg.C and 50 deg.C. until used.
 - .4** Protect mortar from rain and snow.
- .2** Maintain dry beds for masonry and use dry masonry units only. Do not wet masonry units in cold weather.
- .3** When air temperature is below -4 deg.C, protect and heat masonry to maintain air temperature above 0 deg.C. on both sides of walls during operations and for period of 24 h after.
- .4** When air temperature is above -4 degC, erect windbreaks to prevent differential freezing of walls.

.3 Hot Weather Requirements

- .1** Protect freshly laid masonry from drying too rapidly, by means of waterproof, non-staining coverings.

5.4.2 MORTAR AND GROUT FOR MASONRY

.1 Reference Standard

- .1** Do masonry mortar and grout work in accordance with CSA A179-M1976 except where specified otherwise.

.2 Materials

- .1** To meet specified requirements of CSA A179-M1976.

.3 Mortar Types

- .1** Mortar for exterior brick masonry above grade: Type N.
- .2** Mortar for brick masonry at or below grade: Type M.
- .3** Mortar for concrete masonry in exterior walls: Type S.
- .4** Mortar for interior concrete masonry: Type N.

.4 Mortar Mixes

- .1 Mix mortars as specified in CSA Standard A179-M1976. Use only dry aggregate. Test for bulking to determine accurate proportioning.

.5 Mixing

- .1 Mix grout to semi-fluid consistency.

5.4.3 MASONRY ACCESSORIES

.1 Control Joints

- .1 Install continuous control joint fillers in control joints as required.

.2 Weep Hole Vents

- .1 Install weep hole vents in vertical joints immediately over flashings, in exterior wythes of cavity wall construction, at maximum horizontal spacing of 2'-0" o.c. Set weep holes to drain at bed level, and at third brick level.
- .2 Ensure that all weep holes are clear of mortar.

.3 Masonry Flashing

- .1 Install flexible through wall flashings in masonry in accordance with CAN3-S304-M78 and as follows:
 - .1 Install flashings under exterior masonry bearing on foundation walls, slabs, shelf angles, and steel angles over openings. Install flashings under weep hole courses. Secure to air barrier at walls.
 - .2 Install 12" wide piece of flashing centered over all joints between shelf angles. Bond flashing to angles as recommended by manufacturer.
 - .3 In double wythe walls carry flashings from front edge of masonry, under outer wythe, then up backing not less than 8".
 - .4 Lap joints 6" and seal as per manufacturer's instructions.

5.4.4 MASONRY REINFORCING & TYING

.1 Reference Standards

- .1 Do masonry reinforcing and tying in accordance with CAN3-S304-M78 and NBCC 1990 Part 9 unless specified otherwise.

.2 Materials

- .1 Joint Reinforcement:

- .1 For single wythe walls: 9 ga. side rods, welded to a continuous diagonal formed cross rod forming a truss design, galvanized after manufacturer.
- .2 For cavity walls: 9 ga. stainless steel, cavity wall tie.
- .2 Flexible anchor for tying masonry veneer to wood stud backup: 3/16" stainless steel web tie and anchor. Tie to extend 3" into masonry.
- .3 Flexible anchor for tying masonry walls to structural steel: 3/16" galvanized steel web tie and anchor. Tie to extend 8" into concrete block.
- .4 Dovetail Anchor: 9 ga. stainless steel anchor to suit dovetail anchor slot, complete with 3/16" stainless steel triangular ties.
- .5 Reinforcing Steel for Reinforced Masonry: to CSA A371-M1980 G30.12.

5.4.5 UNIT MASONRY

- .1 Face Brick
 - .1 Clay Face Brick: to CSA A82.1-M87.
 - .1 Type: FBS
 - .2 Grade: SW
 - .3 Size: Standard modular
 - .4 Include special shapes as required
- .2 Concrete Masonry Units
 - .1 Standard Concrete Masonry Units: to CSA A165.1-M85.
 - .1 Classification: Hollow units H/15/A/M, solid units S/15/A/M.
 - .2 Special Shapes: Provide bull-nosed units for all exposed corners and at window sills. Provide purpose-made shapes for lintels and bond beams. Provide additional special shapes as required.
- .3 Laying Masonry
 - .1 Unless otherwise specified, lay masonry to meet specified requirements of CAN3-S304-M78.

5.5 STEEL

5.5.1 STRUCTURAL STEEL

1. Design
 1. All structural steel work is to be designed and inspected by a

.2 References

- .1 ASTM A36/A36M-91, Specification for Structural Steel.
- .2 CAN/CGSB-85.100-M81, Painting, Section 09900.
- .3 CAN/CSA-G40.20-M92, General Requirements for Rolled or Welded Structural Quality Steel.
- .4 CAN/CSA-G40.21-M92, Structural Quality Steels.
- .5 CAN/CSA-G164-M92, Hot Dip Galvanizing of Irregularly Shaped Articles.
- .6 CAN/CSA-S16.1-M94, Limit States Design of Steel Structures.
- .7 CAN/CSA-S136-M94, Cold Formed Steel Structural Members.
- .8 CSA W47.1-92, Certification of Companies for Fusion Welding of Steel structures.
- .9 CSA W48 Series-M1980 to M1992, Electrodes.
- .10 CSA W55.3-1965, Resistance Welding Qualification Code for Fabricators of Structural Members Used in Buildings.
- .11 CSA W59-M1989, Welded Steel Construction Metal Arc Welding.
- .12 CISC/CPMA 1-73b, Quick-Drying, One-Coat Paint for Use on Structural Steel.

.3 Design of Details and Connections

- .1 Design details and connections in accordance with requirements of CAN/CSA-S16.1 to resist forces, moments, shears and allow for movements indicated.

.4 Materials

- .1 Structural steel: to CAN/CSA-G40.21 Grade 300W and Grade 350W Class H for HSS Sections.
- .2 Anchor bolts: to CAN/CSA-G40.21, Grade 300W.
- .3 Bolts, nuts and washers: to ASTM A325M.
- .4 Welding materials: to CSA W48 Series and certified by Canadian Welding Bureau.
- .5 Shop paint primer: to CISC/CPMA 1.
- .6 Hot dip galvanizing: galvanize steel, where exposed to outside to CAN/CSA-G164, minimum zinc coating of 600 g/m².

.5 Fabrication

- .1 Fabricate structural steel, as indicated, in accordance with CAN/CSA-S16.1 and in accordance with reviewed shop drawings.
- .2 Provide 1/4" diameter x 9" long hump rods @ 16" o/c on all faces of all columns which will be adjacent to concrete block partitions.

- .6 **Shop Painting**
 - .1 For steel not to receive finish painting on site: clean, prepare surfaces and shop prime structural steel in accordance with CAN/CSA-S16.1 except where members to be encased in concrete.
 - .2 For steel to receive further finish painting on site: clean, prepare surfaces and shop prime in accordance with CISC-2-75 (brush blasted).
- .7 **General**
 - .1 Do structural steel work in accordance with CAN/CSA-S16.1 and CAN/CSA-S136.
 - .2 Do welding in accordance with CSA W59.
 - .3 Companies to be certified under Division 1 or 2.1 of CSA W47.1 for fusion welding of steel structures and/or CSA W55.3 for resistance welding of structural components.
- .8 **Erection**
 - .1 Erect structural steel, as indicated and in accordance with CAN/CSA-S16.1 and in accordance with reviewed erection drawings.
 - .2 Obtain written approval of Engineer prior to field cutting or altering of structural members.
 - .3 Clean with mechanical brush and touch up shop primer to bolts, rivets, welds and burned or scratched surfaces at completion of erection.
 - .4 Continuously seal members by continuous welds where indicated. Grind smooth.

5.5.2 STEEL JOISTS

- .1 **References**
 - .1 CAN/CGSB-85.100-M81, Painting, Section 09900.
 - .2 CAN/CSA-G40.20-M92, General Requirements for Rolled or Welded Structural Quality Steel.
 - .3 CAN/CSA-G40.21-M92, Structural Quality Steels.
 - .4 CAN/CSA-S16.1-M94, Limit States Design of Steel Structures.
 - .5 CSA W47.1-92, Certification of Companies for Fusion Welding of Steel Structures.
 - .6 CSA W55.3-1965, Resistance Welding Qualification Code for Fabricators of Structural Members Used in Buildings.
 - .7 CSA W59-M1989, Welded Steel Construction Metal Arc Welding.

- .8 CISC/CPMA 2-75, Quick-Drying, Primer for Use on Structural Steel.
- .2 Design of Steel Joists and Bridging
 - .1 Design steel joists and bridging to carry loads in accordance with CAN/CSA-S16.1, CAN/CSA-S136.
 - .2 Design joists and anchorages for uplift forces.
 - .3 Limit roof joist deflection due to specified live load to 1/240 of span.
 - .4 Limit floor joist deflection due to specified live load to 1/360 of span.
- .3 Materials
 - .1 Structural steel: to CAN/CSA-G40.21-M92 and CAN/CSA-S136.
 - .2 Welding materials: to CSA W59-89 with CSA W59S1.
 - .3 Shop paint primer: to CISC/CPMA, 1 CISC/CPMA 2.
- .4 Fabrication
 - .1 Fabricate steel joists and accessories as indicated in accordance with CAN/CSA-S16.1, CAN/CSA-S136 and in accordance with reviewed shop drawings.
 - .2 Weld in accordance with CSA W59 and with CSA W59S1.
 - .3 Provide top, bottom chord extensions where indicated.
 - .4 Provide diagonal and horizontal bridgings and anchorages as required.
 - .5 Make allowance through the top chord of the joists for drilling holes to support lighting, etc. in the gymnasium.
- .5 Shop Painting
 - .1 For joists not to receive finish painting on site.
 - .1 Clean, prepare and shop prime all surfaces of steel joists to CAN/CSA-S16.1, CAN/CGSB-85.100.
 - .2 Strip paint bolts, nuts, sharp edges and corners before prime coat is dry.
 - .1 For joist to receive further finish painting on site:
 - .1 Clean, prepare and shop prime all surfaces of steel joists to C1SC-2-75(brush blasted).
 - .2 Strip paint bolts, nuts, sharp edges and corners before prime coat is dry.
- .6 General
 - .1 Do structural steel work in accordance with CAN/CSA-S16.1, CAN/CSA-S136.

- .2 Do welding in accordance with CSA W59 and with CSA W59S1.
- .3 Companies to be certified under Division 1 or 2.1 of CSA W47.1 for fusion welding and/or CSA W55.3 for resistance welding.
- .4 Provide certification that all welders joints are qualified by Canadian Welding Bureau.

7 Erection

- .1 Erect steel joists and bridging as indicated in accordance with CAN/CSA-S16.1.
- .2 Complete installation of all bridging and anchorages before placing construction loads on joists.
- .3 Obtain written approval from Engineer prior to field cutting or altering joists or bridging.
- .4 Clean and touch up shop primer to bolts, welds, burned or scratched surfaces at completion of erection.

5.5.3 STEEL DECK

1 References

- .1 CAN/CSA-S16.1-M94, Limit States Design of Steel Structures.
- .2 CAN/CSA-S136-M94, Cold Formed Steel Structural Members.
- .3 CSA W59-M1989, Welded Steel Construction, (Metal Arc Welding).
- .4 CSA W59S1-M1989, Supplement No. 1 to W59-M1989, Welded Steel Construction Metal Arc Welding.
- .5 CAN/CGSB-1.181-92, Ready-Mixed Organic Zinc-Rich Coating.
- .6 CSSBI 10M-86(Rev. 88), Steel Roof Deck.
- .7 CSSBI 101M-84; Zinc Coated Structural Quality Steel Sheet for Steel Deck.
- .8 CSA W47.1-92, Certification of Companies for Fusion Welding of Steel Structures.
- .9 CSA W55.3-1965, Resistance Welding Qualification Code for Fabricators of Structural Members Used in Buildings.

2 Design Criteria

- .1 Design steel deck using limit states design in accordance with Canadian Sheet Steel Building Institute CSSBI 10M.
- .2 Steel deck and connections to carry dead, live diaphragm action lateral loads, composite deck action, uplift and other loads.
- .3 Deflection under specified live load not to exceed 1/240 th of span, except that when gypsum board ceilings are hung directly from deck, live load deflection not to exceed 1/360 th of span.

- .4 Where vibration effects are to be controlled as indicated, dynamic characteristics of decking system to be designed to be in accordance with CAN/CSA-S16.1, Appendix 'G'.

.3 Materials

- .1 Zinc-iron Alloy ZF coated steel sheet: to ASTM A446/A446M or CSSBI 101M structural quality GradeA with ZF75 coating, for interior surfaces not exposed to weather, where no finish painting is to occur .76 mm base steel thickness.
- .1 Where deck is to be painted, supply wiped or satin coated decking.
- .2 Acoustic insulation: fibrous glass 17.5 kg/m³ density profiled to suit deck flutes.
- .3 Closures: as recommended by manufacturer.
- .4 Cover plates, cell closures and flashings: steel sheet with minimum base steel thickness of 0.76 mm. Metallic coating same as deck material.
- .5 Touch Up Primer: zinc rich, ready mix to CAN/CGSB-1.181.

.4 Types of Decking

- .1 Acoustic steel roof deck: Perforated on vertical face of flutes, interlocking side laps. Provide acoustic deck over the gymnasium, cafeteria, music room, stage and stage storage.

.5 Erection

- .1 Design, detail, fabricate and erect in accordance with CAN/CSA-S136 and CSSBI 10M.
- .2 Do welding in accordance with CSA W59 and with CSA W59S1, except where specified otherwise.
- .3 Welding companies to be certified under Division 1 or 2.1 of CSA W47.1 for fusion welding of steel decks and/or CSA W55.3 for resistance welding.
- .4 Erect steel deck in accordance with CAN/CSA S136 and CSSBI 10M except as specified otherwise.
- .5 Butt ends: to 1.5 to 3 mm gap. Install steel cover plates over gaps wider than 3 mm.
- .6 Lap ends: to 50 mm minimum.
- .7 Immediately after deck is permanently secured in place, touch up metallic coated top surface with compatible primer where burned by welding.
- .8 Prior to concrete placement, steel deck to be free of soil, debris, standing water, loose mill scale and other foreign matter.

- .9 Place and support steel reinforcement to maintain covers to reinforcement as indicated.
- .6 Closures
 - .1 Install closures as required. In all cases to ensure effective closures against weather, thermal and acoustic effects.
 - .2 For details not indicated, follow manufacturer's recommendations.
- .7 Openings and Areas of Concentrated Loads
 - .1 No reinforcement required for openings cut in deck which are smaller than 150 mm square.
 - .2 Frame deck openings with any one dimension between 150 to 300 mm as recommended by manufacturer, except as otherwise indicated.
 - .3 For deck openings with any one dimension greater than 300 mm and for areas of concentrated load, reinforce in accordance with structural framing details, except as otherwise indicated.
- .8 Connections
 - .1 Install connections in accordance with CSSBI recommendations as indicated.

5.5.4 METAL FABRICATION

- .1 References
 - .1 ASTM A53-87b Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
 - .2 ASTM A269-87a Specification for Seamless and Welded-Austenitic Stainless Steel Tubing for General Service.
 - .3 ASTM A307-87 Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile.
 - .4 CGSB 1-GP-40M-79 Primer, Structural Steel, Oil Alkyd Type.
 - .5 CGSB 1-GP-181M-77 Coating, Zinc-Rich, Organic, Ready Mixed.
 - .6 CAN/CSA-G40.21-M87 Structural Quality Steels.
 - .7 CSA G164-M1981 Hot Dip Galvanizing of Irregularly Shaped Articles.
 - .8 CAN/CSA-S16.1-M89 Limit States Design of Steel Structures.
 - .9 CSA W47.1-1983 Certification of Companies for Fusion Welding of Steel Structures.
 - .10 CSA W55.3-1965 Resistance Welding Qualification Code for Fabricators of Structural Members Used in Buildings.
 - .11 CSA W59-1989 Welded Steel Construction Metal Arc Welding.

- .2 **Materials**
- .1 Steel sections and plates: to CAN/CSA-G40.21, Grade 300W and 350W.
 - .2 Steel pipe: to ASTM A53 galvanized finish.
 - .3 Welding materials: to CSA W59.
 - .4 Bolts and anchorbolts: to ASTM A307.
 - .5 Galvanizing: hot dipped galvanizing with zinc coating 600 g/m² to CSA G164.
 - .6 Stainless steel tubing: to ASTM A269, Type 302 Commercial grade.
 - .7 Chromium plating: chrome on steel with plating sequence of 0.009 mm thickness of copper 0.010 mm thickness of nickel and 0.0025 mm thickness of chromium.
 - .8 Shop coat primer: to CGSB 1-GP-40M.
 - .9 Zinc primer: zinc rich, ready mix to CGSB 1- GP-181M.
 - .10 Grout: non-shrink, non-metallic, flowable, 24h, MPa 15, pull-out strength 7.9 MPa.
- .3 **Fabrication**
- .1 Fabricate work square, true, straight and accurate to required size, with joints closely fitted and properly secured.
 - .2 Use self-tapping shake-proof flat headed screws on items requiring assembly by screws or as indicated.
 - .3 Where possible, fit and shop assemble work, ready for erection.
 - .4 Ensure exposed welds are continuous for length of each joint. File or grind exposed welds smooth and flush.
- .4 **Erection**
- .1 Do welding work in accordance with CSA W59 unless specified otherwise.
 - .2 Companies to be certified under Division 1 or 2.1 of CSA W47.1 for fusion welding, CSA W55.3 for resistance welding.
 - .3 Erect metal work square, plumb, straight, and true, accurately fitted, with tight joints and intersections.
 - .4 Make field connections with high tensile bolts to CAN/CSA-S16.1, or weld.
 - .5 Touch-up galvanized surfaces with zinc rich primer where burned by field welding.

5.5.5 METAL STAIRS

- .1 **References**
- .1 Aluminum Association Designation System for Aluminum

- Finishes-1980.
- .2 ASTM A36M-90 Specification for Structural Steel.
 - .3 ASTM A53-90a Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
 - .4 ASTM A307-90, Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile.
 - .5 ASTM A325M-90, Specification for High-Strength Bolts for Structural Steel Joints.
 - .6 ANSI/NAAMM MBG 531-88 Metal Bar Grating Manual.
 - .7 CAN/CGSB-1.40-M89 Primer, Structural Steel, Oil Alkyd Type.
 - .8 CAN/CSA-G40.21-M92 General Requirements for Rolled or Welded Structural Quality Steel.
 - .9 CSA W59-M1989 Welded Steel Construction (Metal Arc Welding).
- .2 Design Criteria
- .1 Design metal stair, balustrade and landing construction and connections to NBC vertical and horizontal live load requirements.
 - .2 Detail and fabricate stairs to NAAMM Metal Stairs Manual fourth edition 1982.
- .3 Materials
- .1 Steel sections: to CAN3-G40.21, Grade 300W or ASTM A36M.
 - .2 Steel plate: to CAN3-G40.21, Grade 260W.
 - .3 Steel pipe: to ASTM A53, standard weight, schedule 40, seamless black.
 - .4 Steel tubing: to CAN3-G40.21, Grade 350, sizes and dimensions as indicated.
 - .5 Aluminum bar, rod, wire and extruded shapes: to CSA HA.5 .6351-T6.
 - .6 Welding materials: to CSA W59.
 - .7 Bolts: to ASTM A307.
 - .8 High strength bolts: to ASTM A325M.
 - .9 Shop coat primer: to CGSB 1-GP-40M.
- .4 Aluminum Finishes
- .1 Finish exposed surfaces of aluminum components in accordance with Aluminum Association Designation System for Aluminum Finishes - 1980.
- .5 Fabrication
- .1 Weld connections where possible, otherwise bolt connections. Countersink exposed fastenings, cut off bolts flush with nuts. Make

- exposed connections of same material, colour and finish as base material on which they occur.

 - .2 Accurately form connections with exposed faces flush; mitres and joints tight. Make risers of equal height.
 - .3 Grind or file exposed welds and steel sections smooth.
 - .4 Shop fabricate stairs in sections as large and complete as practicable.

.6 Shop Painting

 - .1 Clean surfaces in accordance with Steel Structures Painting Council SSPC-SP2.
 - .2 Apply one coat of shop primer except interior surfaces of pans.
 - .3 Apply two coats of primer in different colours to parts inaccessible after final assembly.
 - .4 Use primer as prepared by manufacturer without thinning or adding admixtures. Paint on dry surfaces, free from rust, scale, grease, do not paint when temperature is below 7°C.
 - .5 Do not paint surfaces to be field welded.

.7 Installation of Stairs

 - .1 Install plumb and true in exact locations, using welded connections wherever possible to provide rigid structure. Provide anchor bolts, bolts and plates for connecting stairs to structure.
 - .2 Hand items over for casting into concrete or building into masonry to appropriate trades together with setting templates.
 - .3 Do welding work in accordance with CSA W59 unless specified otherwise.
 - .4 Touch up shop primer to bolts, welds, and burned or scratched surfaces at completion of erection.

5.6 CARPENTRY

5.6.1 ROUGH CARPENTRY

- 1 Source Quality Control

.1 Lumber identification: by grade stamp of an agency certified by Canadian Lumber Standards Accreditation Board.

.2 Plywood Identification: by grade mark in accordance with applicable CSA standards.

- .2 Lumber Material
 - .1 Spruce-Pine-Fir Species Group Designation, framing lumber and boards in conformance with minimum lumber grades for specific end uses of the NBC-1985, kiln dried.
 - .2 Moisture content of lumber at time of building shall not exceed 19%.
- .3 Lumber Material
 - .1 Douglas fir plywood (DFP): to CSA 0121-M1978, standard construction.
 - .2 Canadian softwood plywood (CSP): to CSA 0151-M1978, standard construction. For Utility use: Unsanded sheathing grade. For sub-flooring: T&G unsanded select sheathing grade.
- .4 Fasteners
 - .1 Nails, spikes and staples: to CSA B111-1974. Galvanized for exterior work, at interior high humidity areas and for treated lumber. Plain finish elsewhere.
 - .2 Bolts: 1/2" diameter galvanized unless indicated otherwise, complete with nuts and washers.
 - .3 Proprietary fasteners: toggle bolts, expansion shields and lag bolts, screws and lead or inorganic fibre plugs, recommended for purpose by manufacturer.
 - .4 Galvanizing: to CSA G164--M1989, use galvanized fasteners for exterior work.
- .5 Wood Preservative
 - .1 Surface applied wood preservative: coloured, copper napthenate or 5% pentachlorophenol solution, water repellent preservative to meet specified requirements of CSA 080-1983.
- .6 Damp Proof Membrane
 - .1 6 mils polyethylene film.
- .7 Construction
 - .1 Comply with requirements of NBC 1995, Part 9, supplemented by the following paragraphs.
- .8 Nailing Strips, Grounds and Rough Bucks
 - .1 Install rough bucks, nailers and linings to rough openings as required to provide backing for frames and other work. Install wood blocking in drywall partitions for anchoring of counters, vanities, cupboards, etc.

- .9 **Fasteners**
 - .1 Frame, anchor, fasten, tie and brace members to provide necessary strength and rigidity.
 - .2 Countersink bolts where necessary to provide clearance for other work.
- .10 **Damproofing**
 - .1 Install damproof membrane between wood members, and concrete.
- .11 **Adjustment**
 - .1 Ensure that bolted fasteners are drawn up tightly.

5.6.2 FINISH CARPENTRY

- .1 **Reference Standards**
 - .1 Do millwork to Quality Standards of Architectural Woodwork Manufacturers' Association.
- .2 **Cabinet Construction**
 - .1 Cabinet construction shall be either solid wood (plywood) or MDF (Medium Density Fibreboard). Other materials will not be acceptable.
- .3 **Materials**
 1. Moisture content of wood at time of installation shall be for interior locations 7%, and for exterior locations 12%.
 2. Use only adhesives and fastenings that develop sufficient strength for intended use, are non-staining, and are unaffected by the environment to which exposed.
 3. Wood: Grade mark softwood and hardwood lumber by the appropriate association under authority of the National Lumber Grades Authority. Where not exposed to view, use wood of grades suitable for fabrication, utility and structural needs. Where exposed to view, use wood to meet requirements of AWMAC Quality Grade Standard.
 4. Hardwood plywood: to CSA 0115-M1982 of species and thickness indicated, rotary veneer. Use veneer core with Type II bond. Good grade where exposed to view and sound grade where not.
 5. Canadian softwood plywood: to CSA 0151-1978. Sanded exterior grade, solid two sides where both sides are exposed to view and good one side where only one side exposed to view.
 6. Douglas fir plywood: to CSA 0121-M1978, exterior grade, good two sides where both sides are exposed to view and good one side

where only one side exposed to view.

.7 Poplar plywood: to CSA 0153-1976.

.8 Plastic Laminate: commercial grade to meet specified requirements of CSA Standard A172-M79.

.9 Plastic laminate for cabinets 3/4" thick, solid arborite.

.3 **Fastening**

.1 Fasten work with nails generally, but use screws or special fasteners at critical joints, and where required by specified quality grade standards.

.2 Glue built-up work as well as nailing and screwing.

.3 Blind nail unless impossible.

.4 Set finishing nails below finished surfaces to receive putty.

.4 **Finishing**

.1 Finish each surface of Work of specified quality grade standard where exposed or semi-exposed.

.2 Fine sand surfaces level and smooth after fabrication.

5.7 THERMAL AND MOISTURE PROTECTION

5.7.1 BITUMINOUS MEMBRANE WATERPROOFING

.1 **Materials**

.1 **Asphalt:**

.1 For application and curing at temperatures above 5°C : to CGSB 37-GP-2M.

.2 For application and curing at temperatures below 5°C: to CGSB 37-GP-9M.

.2 Asphalt Primer: to CGSB 37-GP-2M and CGSB 37-GP-9Ma.

.3 Reinforcing Fabric: to CGSB 37-GP-63M synthetic resin or asphalt bonded type.

.4 Sealing Compound: rubber asphalt to CGSB 37-GP-29M.

.5 Protection Board: rigid insulation as noted on the drawings.

5.7.2 SHEET VAPOUR & AIR BARRIERS

.1 **Sheet Vapour Barrier**

.1 Polyethylene Film: to CAN2-51.34-M86, Type CMHC approved, Milrol-2000, 0.15 mm thick.

- .2 Membrane Air Barrier & Flexible Membrane Flashings
 - .1 SBS modified bituminous air barrier membrane, minimum 40 mil thick.
- .3 Sheet Vapour Barrier Installation
 - .1 Install sheet vapour barrier on warm side of exterior wall and ceiling assemblies prior to installation of gypsum board to form continuous barrier.
 - .2 Use sheets of largest practical size to minimize joints.
 - .3 Inspect sheets for continuity. Repair punctures and tears with sealing tape before work is concealed.
 - .4 Exterior Surface Openings
 - .1 Cut sheet vapour barrier to form openings and ensure material is lapped and sealed to door and window frames.
 - .2 Lap and seal air barrier membrane over vapour barrier at openings to provide continuity.
- .5 Perimeter Seals
 - .1 Seal perimeter of sheet vapour barrier as follows:
 - .1 Apply continuous bead of sealant to substrate at perimeter of sheets.
 - .2 Lap sheet over sealant and press into sealant bead.
 - .3 Ensure that no gaps exist in sealant bead. Smooth out folds and ripples occurring in sheet over sealant.
- .6 Lap Joint Seals
 - .1 Seal lap joints of sheet vapour barrier as follows:
 - .1 Attach first sheet to substrate.
 - .2 Apply continuous bead of sealant over solid backing at joint.
 - .3 Lap adjoining sheet minimum 6" and press into sealant bead.
 - .4 Ensure that no gaps exist in sealant bead. Smooth out folds and ripples occurring over sealant.
- .7 Electrical
 - .1 Seal electrical switch and outlet device boxes that penetrate vapour barrier as follows:
 - .1 For sheet-type vapour barriers, install moulded box vapour barrier.
 - .2 Apply sealant to seal edges of flange to main vapour barrier and seal wiring penetrations through box cover.

- .4 Air Barrier Installation
- .1 Apply air barrier membrane to the exterior surface of all concrete block, plywood, exterior grade drywall, etc. and where the continuity is broken by a change in substrate i.e. block to steel, block to plywood, windows and door openings, etc.
 - .2 Apply in strict accordance with manufacturer's instructions.
 - .3 Roll completely after each sheet is applied.
 - .4 Prime substrate as per manufacturer's recommendations for the intended application.
 - .5 All side laps to be minimum 2" and end laps minimum 6".
 - .6 Maintain continuity of the air barrier from walls to the roof as indicated.
 - .7 Lap air barrier with vapour barrier at all windows and door openings.
 - .8 Connect air barrier to window frames and door frames to provide air tight seals.
 - .9 Apply spray on air barrier to any difficult detail areas which do not allow for easy installation of the sheet membrane.
 - .10 Ensure continuity of air barrier by lapping spray on and roll on membrane air barriers.
 - .11 Use air barrier membrane for through flexible through wall flashings in masonry walls and where indicated.

5.7.3 BUILDING INSULATION

- .1 Batt Insulation
 - .1 Glass Fibre Batts: to meet specified requirements of CSA Standard A 101-M1977, Type IA.
 - .2 Mineral Wool Batts: to meet specified requirements of ASTM-C-612, Class 1.
- .2 Installation
 - .1 Batt Insulation
 - .1 Ensure that insulation is supported to prevent settlement.
 - .2 Install friction fit batts snugly between framing members.
 - .3 Fit batt insulation snugly and without compression into every void to ensure full thickness for full length of construction, and to prevent air movement simultaneously on both sides of insulation.
 - .2 Cavity Wall Installation:
 - .1 Secure cavity wall insulation to substrate by wedging fasteners between masonry ties and insulation/
 - .3 Adhesive Installation on Foundation Walls:

- .1 Secure installation by adhesive if backfilling is not immediately placed to retain panels in place.
- .2 Prime surfaces before application of adhesive only where and as recommended by adhesive manufacturer.
- .3 Apply 2" diameter pads of adhesive to faces of panels as required to hold board in place on walls.
- .4 Position and press boards into full contact with adhesive, and temporarily hold them in place until adhesive has set.
- .5 Ensure that backfilling is completed within 24 hours, and that it does not dislodge or damage insulation.

5.7.4 FIRE STOPPING

- .1 Materials: Fire stopping and smoke seal systems: Intumescent type in accordance with CAN4-S115-M85.
 - .1 Asbestos-free materials and systems capable of maintaining an effective barrier against flame, smoke and gases in compliance with requirements of CAN4-S115-M85 and not to exceed opening sizes for which they are intended.
- .2 Service penetration assemblies: certified by ULC in accordance with CAN4-S115-M85 and listed in ULC Guide No. 40 U19.
- .3 Service penetration firestop components: certified by ULC in accordance with CAN4-S115-M85 and listed in ULC Guide No. 40 U19.13 and ULC Guide No. 40 U19.15 under the Label Service of ULC.
- .4 Fire-resistance rating of installed fire-stopping assembly not less than the fire-resistance rating of surrounding floor and wall assembly.
- .5 Fire stopping at openings intended for ease of re-entry such as cables: elastomeric seal; do not use cementitious or rigid seal at such locations.
- .6 Fire stopping at openings around penetrations for pipes, ductwork and other mechanical items requiring sound and vibration control: elastomeric seal; do not use a cementitious or rigid seal at such locations.
- .7 Primers: to manufacturer's recommendation for specific material, substrate, and end use.
- .8 Water (if applicable): potable, clean and free from injurious amounts of deleterious substances.

- .9 Damming and backup materials, supports and anchoring devices: to manufacturer's recommendations, and in accordance with tested assembly being installed as acceptable to authorities having jurisdiction.
- .10 Sealants for vertical joints: non-sagging.
- .11 Preparation
 - .1 Examine sizes and conditions of voids to be filled to establish correct thicknesses and installation of materials. Ensure that substrates and surfaces are clean, dry and frost free.
 - .2 Prepare surfaces in contact with fire stopping materials to manufacturer's instructions.
 - .3 Maintain insulation around pipes and ducts penetrating fire separation without interruption to vapour barrier.
 - .4 Mask where necessary to avoid spillage and over coating onto adjoining surfaces; remove stains on adjacent surfaces.
- .12 Installation
 - .1 Install fire stopping material and components in accordance with ULC standard systems certification and manufacturer's instructions.
 - .2 Seal holes or voids made by through penetrations, poke-through termination devices, and unpenetrated openings or joints to ensure continuity and integrity of fire separation are maintained.
 - .3 Provide temporary forming as required and remove forming only after materials have gained sufficient strength and after initial curing.
 - .4 Tool or trowel exposed surfaces to a neat finish.
 - .5 Remove excess compound promptly as work progresses and upon completion.

5.7.5 MODIFIED BITUMEN ROOFING SYSTEM & FLASHING

- .1 Quality Assurance
 - .1 Roofing system must be applied by a roofing contractor authorized by the roofing manufacturer.
 - .2 Upon completion of the installation, an inspection shall be made by a representative of roofing manufacturer to ascertain that the roofing system has been installed according to the applicable specifications and details. A written final inspection report from the manufacturer shall be made available.

.2 **Standards For Uplift**

.1 The finished roof shall meet or exceed the Factory Mutual I-90 for standards for uplift as approved in writing by Factory Mutual, as to assembly and materials.

.3 **Drywall**

.1 Gypsum Board: 1/2" exterior grade utility board.

.4 **Asphalt Primer**

.1 Black bituminous varnish. An asphalt modified bitumen with thermoplastic polymers and volatile solvents.

.5 **Asphalt**

.1 Type II and III in compliance with CSA A 123-7.

.6 **Asphalt Felts**

.1 No. 15 perforated asphalt felts.

.7 **Insulation**

.1 CFC free.

.2 Extruded polystyrene Type IV or polyisocyanurate or expanded polystyrene, Type 2.

.3 R-20 with a minimum thickness of 3".

.4 Tapered where required to ensure positive drainage, minimum slope 1 1/2% to drains.

.8 **Fibreboard**

.1 Wood fibre insulation board, to CSA A247-M1978, Type I, asphalt impregnated and coated fibreboard.

.9 **Membranes**

.1 **Base Sheet**

.1 Reinforcement: non-woven polyester 180 g/m²

.2 Elastomeric asphalt: mix of selected bitumen and thermoplastic polymer.

.3 Top face covered with a thermofusible plastic film.

.4 Underface lightly sanded.

.5 Minimum thickness 2mm.

.2 **Base Flashing:**

.1 Have a non-woven polyester reinforcement and thermofusible elastomeric asphalt. Both sides shall be protected by a thermofusible plastic film. This membrane is to be applied by torching only.

- .2 Reinforcement: non-woven polyester, 180 g/m².
- .3 Thermofusible elastomeric asphalt: mix of selected bitumen and SBS thermoplastic polymer.
- .4 Minimum thickness 2.8 mm.
- .3 Cap Sheet and cap sheet flashing.
 - .1 Shall have a non-woven polyester reinforcement and thermofusible elastomeric asphalt. The top side shall be self-protected with coloured granules. The underside shall be protected by a thermofusible film. This membrane is to be applied by torching only.
 - .2 Reinforcement: 250 g/m² of non-woven polyester.
 - .3 Elastomeric asphalt: mix of selected bitumen and SBS thermoplastic polymer.
 - .4 Minimum thickness 3.8 mm. Note: combined thickness of base sheet and cap sheet must be a minimum of 6mm.
 - .5 Top face protection: ceramic granules, colour from Manufacturer's standard selection.
- .4 Expansion joint membrane:
 - .1 Elastomeric modified bitumen waterproofing membrane.
 - .2 Reinforcing: polyester tissue.
 - .3 Surfaced with thermoplastic foil and a protective silicon paper.
 - .4 Minimum thickness 3.8 mm.
 - .5 Minimum width 18".
- .5 Provide purpose made gussets, etc. as recommended by the manufacturer.
- .6 Provide all other membrane fittings, termination bars, etc. as required to complete the project.

5.7.6 SEALANTS

- .1 Acrylic solvent release, one part sealant: to meet specified requirements of CGSB 19-GP-5M.
- .2 Silicone sealant: one part, mildew resistant to meet specified requirements of CGSB 19-GP-9M2.
- .3 Two part polyepoxide sealant: to meet specified requirements of CGSB 19-GP-24M.

5.8 DOORS & WINDOWS

5.8.1 STEEL HOLLOW METAL DOORS

- .1 Sheet steel: 18 ga. base thickness, commercial grade steel to ASTM A366-72, Class 1 finished to ASTM A526(1975) W25 wiped zinc finish.
- .2 Glazing stops: minimum 20 ga. base thickness sheet steel with W25 wiped zinc finish to ASTM A525-80a screw fixed.
- .3 Door Core:
 - .1 Exterior Doors: Hollow steel, vertically stiffened with steel ribs and all voids filled with incombustible, semi-rigid fibrous insulation or urethane, 1.5 lb./cu.ft., minimum density.
 - .2 Interior Doors: Honeycomb, structural core consisting of kraft paper having 3/4" cell size to thickness indicated.
- .4 Fire Doors: Fire doors shall carry a Fire Underwriter's Laboratory label of classes as required by the drawings.
- .5 Primer: for touch up to CGSB 1-GP-181M+Amdt-Mar-78.
- .6 Fabricate steel doors as detailed, in accordance, with Canadian Steel Door and Frame Manufacturer's Association, "Canadian Manufacturing Specifications for Steel Doors and Frames", 1978 for hollow steel construction, except where specified otherwise.

5.8.2 PRESSED STEEL FRAMES

- .1 Sheet steel: commercial grade steel to ASTM A366-72, Class 1 finished to ASTM A526(1975) W25 wiped zinc finish.
 - .1 Frames: generally 16 ga. base thickness steel.
 - .2 Floor anchors, channel spreaders and wall anchors: minimum 16 ga. base thickness steel.
 - .3 Guard boxes: minimum 22 ga. base thickness steel.
 - .4 Glazing stops: minimum 20 ga. base thickness steel, tamperproof.
- .2 Reinforcing channel: to CSA G40.21-M1978, type 300W.
- .3 Door bumpers: black neoprene single stud.
- .4 Primer: to CGSB 1-GP-181M+Amdt-Mar-78.

- .5 Fabricate frames as detailed, to Canadian Steel Door and Frame Manufacturer's Association, "Canadian Manufacturing Specifications for Steel Doors and Frames", 1978; except where specified otherwise.

5.8.3 ALUMINUM DOORS, FRAMES & SCREENS

- .1 Location: all major entrances shall be aluminum doors.
- .2 Aluminum extrusions: Aluminum Association alloy AA6063-T5, anodizing quality.
- .3 Sheet aluminum: Aluminum Association alloy AA5005-H32.
- .4 Steel reinforcement: to CAN3-G40.21-M81, grade 44W hot dip galvanized to CSA G164-1965 (R1972).
- .5 Fasteners: aluminum, or stainless steel, finished to match adjacent material.
- .6 Weatherstrip: replaceable mohair.
- .7 Isolation coating: alkali resistant, bituminous paint or epoxy solution.
- .8 Glass: Tempered glass to CAN/CGSB-12.1-M79, Type 2, Class B.
- .9 Finishes: Finish exposed surfaces of aluminum components in accordance with Aluminum Association Designation System for Aluminum Finishes - 1980.
- .10 Fabrication
 - .1 Design frames and screens in exterior walls to:
 - .1 Accommodate expansion and contraction within service temperature range of -35 deg.C to 75 deg.C.
 - .2 Limit deflection to 1/175th of clear span tested to ASTM E330-79 under wind loads for building locality as ascertained by NBC Supplement No. 1 Climatic Information for Building Design in Canada.
 - .2 Make allowances for deflection of structure. Ensure that structural loads are not transmitted to aluminum work.
 - .3 Provide replaceable weatherstripping at exterior and vestibule door openings. Weatherstrip bottom of doors with pile sweep strip applied to door rail.

- .11 Aluminum Frames and Screens
 - .1 Frames for doors and screens to be aluminum extrusions 1-3/4" x 4-1/2" with minimum wall thickness 0.120".
- .12 Aluminum Doors
 - .1 Construct doors of porthole extrusions with minimum wall thickness of 0.120".
 - .2 Type: Swing.
 - .3 Construction: heavy duty, minimum style size 1 3/4" x 4".
 - .4 Reinforce mechanically-joined corners of doors by welding, spigotting, welding and spigotting or by one piece of cast aluminum angle to produce sturdy door unit.
 - .5 Glazing stops: interlocking snap-in type for dry glazing. Exterior stops: tamperproof type.

5.8.4 WOOD DOORS

- .1 Door Materials: to CSA 0132.2-Series 90.
- .2 All doors to be solid construction.

5.8.5 ALUMINUM WINDOWS

- .1 Reference
 - .1 CAN3-A440-M90-Windows.
- .2 Certificates
 - .1 Submit manufacturer's certificate, certifying compliance with specification requirements, for:
 - .1 Windows
 - .2 Anodized aluminum finish
 - .2 Architectural coatings
 - .3 Infiltration/exfiltration rates
 - .4 Thermal transfer resistance of frames
- .3 Materials:
 - .1 To CAN-A440-M90 supplemented as follows:
 - .1 All windows by same manufacturer.
 - .2 Sash: aluminum.
 - .3 Main frame: aluminum thermally broken.
 - .4 Operating windows to CAN3-A440-M90, Classification A3, B7, C5 and I50.

- .4 Fabrication
 - .1 Fabricate windows using two separate frames joined by means of a thermal break.
 - .2 Fabricate units to dimensions measured on site.
 - .3 Fabricate window units square and true with maximum tolerance of plus or minus 1/16" for units with diagonal measurement of 6'-0" or less, and plus or minus 1/8" for units with diagonal measurement over 6'-0".
 - .4 Make allowance for deflection of structure. Ensure that structural loads are not transmitted to windows.
 - .5 Manufacturer's nameplates on windows are not acceptable.
 - .6 Install air seal gasket at factory as detailed.
 - .7 Install screens in removable aluminum frames all opening sashes.
- .5 Isolation
 - .1 Isolate aluminum from following components, by means of isolation coating:
 - .1 Dissimilar metals except stainless steel, zinc, or white bronze of small area.
 - .2 Concrete, mortar and masonry.
 - .3 Wood.
- .6 Window Installation
 - .1 Install in accordance with CAN3-A440-M90 Appendix A.
 - .2 Arrange components to prevent abrupt variation in colour.
- .7 Glazing
 - .1 Glaze windows in accordance with CAN3-A440-M90.

5.8.6 DOOR HARDWARE

- .1 Reference Standards
 - .1 Standard hardware location dimensions in accordance with Canadian Metric Guide for Steel Doors and Frames (Modular Construction) prepared by Canadian Steel Door and Frame Manufacture's Association.
 - .2 CAN/CGSB-69.18 M90/ANSI/BHMA A156.1-1981, Butts and Hinges.
 - .3 CAN/CGSB-69.19 M89/ANSI/BHMA A156.3-1984, Exit Devices.
 - .4 CAN/CGSB-69.20 M90/ANSI/BHMA A156.4-1986, Door Controls (closers).
 - .5 CAN/CGSB-69.21 M90/ANSI/BHMA A156.5-1984, Auxiliary Locks & Products.

- .6 CAN/CGSB-69.22 M90/ANSI/BHMA A156.6-1986, Architectural Door Trim.
- .7 CAN/CGSB-69.24 M90/ANSI/BHMA A156.8-1982, Door Controls - Overhead Holders.
- .8 CAN/CGSB-69.29 M90/ANSI/BHMA A156.13-1980, Mortise Locks and Latches.
- .9 CAN/CGSB-69.34 M90/ANSI/BHMA A156.18-1984, Materials and Finishes.
- .10 CAN/CGSB-69.35 M89/ANSI/BHMA A156.19-1984, Power Assist and Low Energy Power Operated Doors.

.2 Requirements Regulatory Agencies

- .1 Use ULC/ULI listed and labelled hardware for doors in fire separations and exit doors.

.3 Door Hardware

.1 Hinges:

- .1 Provide one hinge for each 750 mm or fraction thereof of door height.
- .2 Use ball bearing on all doors unless noted otherwise.
- .3 Size and apply hinges to manufacturer's hinge specification guide. Minimum size for 45 mm door is 112 mm x 100 mm.
- .4 Exterior doors and doors in wet areas are to have non ferrous hinges of bronze or stainless steel.
- .5 Exterior and outswinging doors are to have non-removable pins NRP. -

.2 Locksets:

- .1 All locks and latchsets are to be mortised.
- .2 Lever sets are to be ANSI 156.13 Grade 1.
- .3 All mortise locks are to incorporate the following features: backset 70 mm backset, 2 piece mechanical anti-friction latch bolt of 19 mm throw deadbolt throw 25 mm, curved lip strike ANSI 115.1 Listing ULC 120 1D16.2.19. Cylinders are to be 6 pin interchangeable construction core.
- .4 All hardware shall be lever style.

.3 Exit Devices:

- .1 All exit devices are to be ANSI 156.3 Grade 1. to be listed under "Panic Hardware" in ULC Accident Hazard Section. All exit devices regardless of type shall be of matching design. Use labelled fire exit devices on fire doors. All trim for exit devices shall be thru bolted to the lock style case. Where required, exit devices shall have touch bar locked down by inside cylinder feature. Finishes shall be in

accordance with the finish section of this specification. All exit devices must be of plated finish, painted finishes are not acceptable.

.4 Door Closers:

- .1 Door closes are to be of modern design with full cover, rack and pinion. Shall meet ANSI A156.4 Grade 1 operational tests and have a minimum 10 year warranty. Closer body shall be warranted for the life of the building. Piston shall be 37 mm minimum diameter. The pinion shaft shall be 16 mm diameter. Back check feature shall be controlled two valves strength and position. non handed. To have heavy duty shock absorber on all exterior doors, i.e. Unitrol parallel arm mounted closer with heavy duty shock absorbing positive stop.

.5 Automatic Door Openers:

- .1 Switch actuated power operator shall meet the requirements of ANSI 156.19 Rack and Pinion design. Cast aluminum housing. Closing force shall be adjustable to ensure adequate closing control. The unit shall have three position switch ON, OFF, HOLD OPEN. When the motor is energized the door shall be power opened at both a speed and force which are adjustable. Upon reaching the full open position, it shall be adjustable 0-30 seconds. The door shall close under full spring power when the operator motor is shut off at the unit using the OFF switch. Signs shall be provided indicating an automatic barrier free entrance. Provide push button switches as listed in the schedule. Switches are to be located with easy visibility of door but clear of door travel.

.6 Kickplates:

- .1 Kickplates are to be applied to the push side of doors. Polishing lines or dominant direction of any surface pattern to run across the door .
.2 Material: 16 ga. thick 304 stainless steel.
.3 Size: Height as listed, Width - door width less 37 mm doors, 25 mm less for pairs of doors.
.4 Fasteners: No. 6 screws spaced equal distance along a centre line, 12.5 mm from edge all around plate and counter sunk.

.7 Overhead Stops and Holders:

- .1 Steel arms on interior doors, bronze arms for exterior doors, standard or heavy duty as indicated.

- .8 Door bottom seal: heavy duty, door seal of extruded aluminum frame and solid closed cell neoprene seal, surface mounted closed ends, adjustable automatic retract mechanism when door is open, clear anodized finish.
 - .9 Thresholds: width as listed x full width of door opening, plus 100 mm. Extruded aluminum mill finish, serrated surface.
 - .10 Weatherstripping
 - .1 To be applied continuously around perimeter of head, jambs and mullions of all exterior doors. Extruded aluminum with neoprene gasket.
 - .11 Magnetic Locking System
 - .1 Components and function to be provided as required.
- .4 Miscellaneous Hardware
- .1 Indexed key control system: to CAN/CGSB069.21; wall mounted portable system, type, colour enamel paint finish. To accommodate 1.75 times the number of key changes, dual tag system with permanent loan register.
- .5 Fastenings
- .1 Supply screws, bolts, expansion shields and other fastening devices required for satisfactory installation and operation of hardware.
 - .2 Exposed fastenings devices to match finish of hardware.
 - .3 Where pull is scheduled on one side of door and push plate on other side, supply fastening devices, and install so pull can be secured through door from reverse side. Install push plate to cover fasteners.
 - .4 Use fasteners compatible with material through which they pass.
- .6 Keying
- .1 Doors to be keyed differently, keyed alike, keyed alike in groups and sub and Grand master keyed as directed. Prepare detailed keying schedule for approval after consultation with consultant.
 - .2 Provide keys in duplicate for every lock in this Contract.
 - .3 Provide three masterkeys for each MK group.
 - .4 Stamp keying code numbers on keys and cylinders.
 - .5 All locks and cylinders are to be provided with interchangeable construction cores.

- .7 Installation Instructions
- .1 Install hardware to standard hardware location dimensions in accordance with Canadian Metric Guide for Steel Doors and Frames (Modular Construction) prepared by Canadian Steel Door and Frame Manufacturers' Association.

5.8.7 GLAZING

- .1 Clear Sheet Glass: to CAN2-12.2-M76 B quality.
- .2 Polished Plate or Float Glass to CAN2-12.3-M76, glazing quality.
- .3 Clear wired glass: to CAN2-12.11-M76, Type 1, wire mesh style 4, 1/4" thick.
- .4 Insulating Glass Units: Factory sealed double glazed units - outer lite tinted reflective solar cool grey, 1/4" thick, inner lite 1/4" clear plate or float glass, with a hermetically sealed space of 1/2" width.
- .5 Clear tempered glass: to CAN2-12.1-M79, Type 2, Class B 1/4" thick.
- .6 One way glass: where indicated on the drawings.
- .7 Glazing and Sealing Compound Materials
1. Glazing Compound: oil base, to CGSB 19-GP-6M, Type 1.
 2. Sealant Compound: one component-acrylic base, to CGSB 19-GP-5M+Amdt-Nov-79, gun grade.
 3. Glazing Tape: preformed butyl tape, 10-15 durometer hardness, paper release.
 4. Setting Blocks: neoprene, Shore "A" durometer hardness 70-90.
 5. Spacer shims: neoprene, Shore "A" durometer hardness 40-50.
 6. Primer-sealers and cleaners: to glass manufacturer's standard.

5.9 FINISHES

5.9.1 SUSPENSION SYSTEMS FOR ACOUSTICAL CEILINGS

- .1 Reference Standards
- .1 Installation to ASTM C636-76(1981) except where specified otherwise.

.2 **Design Criteria**

- .1 Maximum deflection: 1/360th of span to ASTM C635-78 deflection test.

.3 **Materials**

- .1 Exposed tee bar grid components: two directional 24" x 24" shop painted satin sheen white unless noted on drawings. Components die cut. Main tee with double web, rectangular bulb and 1" rolled cap on exposed face. Cross tee with rectangular bulb; web extended to form positive interlock with main tee webs; lower flange extended and offset to provide flush intersection. Fire rated where required.
- .2 Hanger Wire: galvanized soft annealed steel wire, 9 ga.
- .3 Hanger Inserts: purpose made.
- .4 Accessories: splices, clips, wire ties, retainers and wall mounting flush reveal, to complement suspension system components, as recommended by system manufacturer.
- .5 Fire-rated as required.

5.9.2 GYPSUM BOARD

.1 **Reference Standards**

- .1 Do work in accordance with CSA A82.31-M1980 except where specified otherwise.
- .2 Plain: to CSA A82.27-M1977 standard and Type X, thickness as required, 4'-0" wide x maximum practical length, ends square cut, edges tapered.
- .3 Water resistant board: to CSA A82.27-M1977 standard 1/2" thick, 4'-0" wide x maximum practical length.

.4 **Metal Furring and Suspension Systems**

1. Metal furring runners, hangers, tie wires, inserts, anchors: to CSA A82.30-M1980, galvanized.
2. Resilient drywall furring: 0.5 mm base steel thickness galvanized steel for resilient attachment of gypsum board.

.5 **Fastenings**

1. Screws: to CSA A82.31-M1980. Self-drilling, self-tapping, case hardened, Philips head, drywall screws, with corrosion resistant finish.

- .6 Accessories
- .1 Casing beads, corner beads fill type: 0.5 mm base thickness commercial grade sheet steel with Z275 zinc finish to ASTM A525M-80, perforated flanges; one piece length per location.
 - .2 Acoustic Sealant: to CGSB 19-GP-21M.
 - .3 Polyethylene: to CAN 2-51.33-M80, 6 mil.
 - .4 Joint Compound: to CSA A82.31-M1980, asbestos free.
 - .5 Joint Tape: 2" x 0.012" thick, perforated paper with chamfered edges.
 - .6 Control Joists: Crimped rolled-formed zinc, with flanges for tape reinforcement, or two casing beads, set with gap for movement and backed with flexible air seal membrane.
 - .7 Special purpose made angles and channels as required and as detailed to support radiant heating panels where applicable.
- .7 Partition System
- .1 Interior Steel Studs: minimum 25 ga. steel, (20 ga. in all areas where abuse resistant drywall is used) galvanized, having knurled flanges 1 1/4" wide edges double back at least 3/16", with girts as required, and with service access holes. Sizes as indicated on drawings.
 - .2 Partition Runners: as specified for studs, with flanges a minimum of 7/8" high, and to suit width of studs.
 - .3 Bracing Channels: 18 ga. 1 1/2" x 3/4" cold rolled steel, wipe coated.
- .8 Insulation
- .1 Thermafibre sound attenuation batts. Minimum 3" thick.
- .9 Hanger Devices: Zinc coated annealed steel wire; to support a maximum weight of 310 lbs. per hanger.

5.9.3 HARD TILE

- .1 Ceramic Mosaic Floor Tile
 - .1 To CAN-75.1-M77, Type 2, Class MR2.
- .2 Ceramic Wall Tile
 - .1 To CAN-75.1-M77, Type 5, Class MR4.
- .3 Ceramic Tile Base
 - .1 100 mm high coved base to match ceramic wall tile.

- .4 Quarry Tile Type 1 (Porcelain)
 - .1 Field: to CAN2-75.1-M77, Type 4, Class MR1, plain face cushioned edges.
- .5 Quarry Tile Type 2
 - .1 To CAN2-75.1-M77, Type 4, Class MR2.
- .6 Quarry Tile Base
 - .1 100 mm high coved base to match floor tile.
- .7 Workmanship
 - .1 Install tile in accordance with details and specifications of the Terrazzo, Tile and Marble Association of Canada Installation Manual.

5.9.4 ACOUSTICAL TILE AND PANELS

- .1 Acoustical Ceiling Tile:
 - .1 Type: CAN2, 92.1, Type 3
 - .2 NRC 0.50-0.60
 - .3 Size: 24" x 24"x 5/8"
 - .4 Fire rated as required.
- .2 Sound Absorbing Panels:
 - .1 Provide 2" thick panels to gymnasium, cafeteria, music room walls, etc. required. 7 pound per cubic foot fibreglass with standard fabric covering, with flame spread rating of 25 or less. Bullnosed vertical edges.
 - .2 Sound absorbing panels in gynamsium to be impact resistant, with scrim facing between fabric and insulation board.

5.9.5 WOOD FLOOR

- .1 Job Conditions
 - .1 Environmental Requirements
 - .1 Install flooring only in areas maintained at an air temperature of not less than 18 deg. C. nor more than 32 deg. C, for a period of at least 72 hours before installation, during installation, and until finishing has been completed and has cured. Do not allow temperature to fall below 13 deg. C. thereafter.
 - .2 Store and install flooring only in areas where relative humidity does not exceed 55%.

- .3 Install flooring only after completion of masonry, drywall, and other similar wet work.
 - .4 Ensure that floor construction is free of foreign material and is broom clean.
 - .5 Ensure that floor finishing is done only in dust-free areas.
 - .6 Ventilate areas in which adhesive are used.
- .2 Protection
- .1 Barricade areas where floor laying and finishing is in progress to prevent traffic over flooring.
 - .2 Cover finished flooring installations with protection adequate to prevent traffic damage, and maintain and replace protection as necessary until Project completion.
- .3 Prohibit smoking, use spark-proof equipment and take all other precautions to avoid fire or explosion, or both, in areas where flammable materials are being used.
- .4 Materials
- .1 Kiln dry flooring and ensure that at time of installation it has an average moisture content of 8%, with permitted range of 6% to 10% in individual pieces.
 - .2 Gymnasium Strip Flooring: #1 Grade Select Northern Hard Maple 25/32" x 1 1/2", T & G, square edge, over two layers of 1/2" fir plywood, square edge.
 - .3 Stage Strip Flooring: Leading Edges 25/32" x 1 1/2" T & G. Maple to match gym flooring. Remainder of stage: 25/32" T & G clear #1 Grade White Pine.
 - .4 Nails: 2" barbed cleat or equivalent.
 - .5 Membrane: 6 mil polyethylene, ultra plus.
 - .6 Pads: Pads minimum 3/4" thick, EPDM.
 - .7 Finish: Urethane floor finish.
 - .8 Wood Base: #1 Grade Maple complete with Maple quarter-round, as per drawings.
 - .9 Game Lines: Enamel paint to colours as indicated on drawings, type compatible with floor finish.
 - .10 Sleepers: 2 x 4 pine, dry secured to concrete floor slab as per manufacturer's instructions, over approved rubber pads.
 - .11 Heavy aluminum thresholds at all door openings.
- .5 Ensure that:
- .1 Environmental conditions have been provided as requested and specified.

- .2 Work specified in other Sections which in execution could interfere with or damage flooring installation has been completed.
- .3 Floor system provides a D.I.N. rating and that the manufacturer has given a written statement of the D.I.N. to be expected.
- .6 Ensure that no contaminants are present on subfloor that would affect bond of adhesive.
- .7 Defective Work resulting from installation of flooring on unsatisfactory surfaces or because of adverse environmental conditions will be considered the responsibility of those performing the Work of this Section.
- .8 Preparation:
 - .1 Clean subfloors to remove dirt, oil, grease and other foreign materials, and vacuum clean.
- .9 Installation:
 - .1 Gymnasium Floor:
 - .1 Apply one layer vapour barrier membrane, lapping edges 4" and up walls 3". Tape all joints.
 - .2 Place first plywood layer containing pneumatic pads, securely stapled to underside, centered 12" apart, using approved 72 pads to each 4' x 8' panel.
 - .3 Butt each panel, installing them the long way of the room allowing 1/4" expansion void between panels at sides and ends.
 - .4 Apply full box "x" pattern of adhesive on plywood.
 - .5 Apply second layer of plywood at 45 deg. to first layer with 1" power staples spaced 6" apart around edges and 12" o.c. in field.
 - .6 Machine nail maple finish flooring with end joints properly driven up and proper spacing provided for humidity conditions. Provide 2" expansion void at the perimeter.
 - .7 Install base in accordance with manufacturer's instructions.
 - .8 Install floor sockets and equipment anchors supplied by others.
 - .2 Stage Strip Flooring: (T & G)

- .1 Lay strips parallel to long axis of stage.
 - .2 Select flooring strips to ensure that distribution is visually and consistently even.
 - .3 Distribute butt joints throughout area, with none in adjacent strips staggered less than 6".
 - .4 Blind nail starting and finish strips, countersink nail heads.
 - .5 Nail strips to plywood subflooring with concealed barbed flooring nails.
- .3 Sanding: Floors shall be sanded after all other trades are finished. All flooring shall be sanded with a minimum of three cuts using coarse medium and fine sandpapers. Final sanding of pattern floors should be performed with a screen and disc sander. This final sanding should provide a smooth and even surface, free from scratches. After sanding, contractor shall thoroughly vacuum floor with heavy duty commercial type vacuum (and request an inspection by Architect or his authorized representative before any finishing work shall start. Ensure that first two coats of finish is applied immediately after sanding to avoid raised grain.
- .4 Game Lines: Apply game lines to gymnasium floor to colours and areas as indicated on drawings.
 - .5 Finishing: The floor shall be thoroughly cleaned prior to first coat of floor sealer. Using clean lambs wool applicator, apply a liberal and uniform coat of penetrating sealer with a minimum coverage of approximately 400 square feet per gallon. Allow to dry thoroughly. Buff with #2 steel wool and thoroughly clean. Apply third coat of penetrating sealer in the same manner as first. Allow to dry thoroughly. Entire surface shall be lightly disced with 150 - grid paper of #2 steel wool under a floor machine, vacuumed and double tack ragged in preparation for court layout and painting.
Note: Allow adequate ventilation during entire sealing and finishing process.
- .1 Apply modified urethane floor finish to gymnasium and stage flooring as recommended by manufacturer (four coat application finish).
- .10 Adjustment and Cleaning
- .1 Refinish damaged or defective Work so that no variation in surface appearance is discernible.

- .2 At completion of Work, and after finish has cured for at least 72 hours, clean flooring.

5.9.6 RESILIENT FLOORING

.1 Materials

- .1 Vinyl composition tile: to CSA A126.1-1977 1/8" thick, 12" x 12" size.
- .2 Resilient base: top set coved rubber, minimum 4'-0" length and 4" high, including premoulded end stops and external corners.
- .3 Resilient stair riser: top set vinyl 1/8" thick, full riser height, solid pattern.
- .4 Stair Treads: resilient stair treads with integral nosing. Top set vinyl 1/8" thick full tread width and length.

.2 Tile Application

- .1 Apply adhesive uniformly using recommended trowel in accordance with flooring manufacturer's instructions. Do not spread more adhesive than can be covered by flooring before initial set takes place.
- .2 Lay flooring with joints parallel to building lines to produce symmetrical tile pattern. Border tiles minimum half tile width.
- .3 Install flooring to square grid pattern with all joints aligned with pattern grain alternating.
- .4 Cut tile and fit neatly around fixed objects.
- .5 Terminate flooring at center line of door in openings where adjacent floor finish or colour is dissimilar.

.3 Stair Application

- .1 Install stair risers and nosings one piece for full width of stair. Adhere over entire surface and fit accurately. Bring tread level up with filler to ensure resilient tile treat flush with nosing.
- .2 Install tile in accordance with Clause 3.2.

.4 Base Application

- .1 Lay out base to keep number of joints at minimum.
- .2 Set base in full bed of adhesive, tightly against wall and floor surfaces.
- .3 Install straight and level to variation of 1:1000.
- .4 Scribe and fit to door frames and other obstructions. Use premoulded end pieces at flush door frames.
- .5 Cope internal corners. Use premoulded corner units for right angle external corners. Use formed straight base material for external

corners of other angles.

- .6 Install toeless type base before installation of carpet on floors.

.5 Accessories

- .1 Install reducer strips at terminations of resilient tile flooring where edges are exposed to view.
- .2 At door openings, install reducer strips and carpet adapters under doors.
- .3 Secure strips and adapters to subfloor with contact bond adhesive to ensure complete bond.

5.9.7 SEAMLESS COMPOSITE FLOOR SYSTEM

.1 Quality Assurance:

.1 General:

- .1 Materials provided shall incorporate the manufacturer's latest improvements in materials in place at time of manufacture.

.2 Site Conditions:

.1 Subfloors:

- .1 Shall be adequately waterproofed beneath the slab and around the perimeter using a suitable membrane.
- .2 Shall be true and level being very flat in accordance with C.S.A. classification A23.1-M90 subsection 22.1.2. Install subfloor to ensure level of finish is within 3 mm of established elevations in any 6 metre area, and shall when measured with a 3 metre straight edge the gap at any point shall not exceed 3 mm; ensure that finish levels do not vary by more than 1 mm per 300 mm.
- .3 Subfloors shall have a steel trowelled finish, and be fully cured; maximum moisture content of 3% measured by the volume percentage method.

.3 Products

.1 General:

- .1 All urethane materials shall be free of any heavy metals such as lead or mercury which could seriously affect human health.
- .2 All urethane materials shall be manufactured by the same manufacturer and designed to chemically react with the previous layer to enhance bonding.
- .3 Shall have a minimum overall thickness of 11 mm.

.2 Acceptable Materials:

- .1 Seamless urethane composition flooring system to meet the following standards:
 - .1 Surface hardness according to DIN 53505
 - .2 Shore A 76 deg.
 - .3 Compressive modulus by D.S.F. 8 Kgf/cm²/mm
 - .4 Rebound resilience DIN 53512 29%
 - .5 Ball Rebound 1.29/2.00 m
 - .6 Wear Resistance Taber h18:
 - 500 cycles 1.7% vol.
 - 1000 cycles 1.9%
 - .7 Compression set DIN 53517 1.9%
 - .8 Impact Resistance by OGI 2 Kgm/cm²
 - .9 Rolling Load Resistance no damage (DIN 18032 100 kg)
 - .10 Tensile Strength DIN 53571 6.5N/m²
 - .11 Elongation at Break DIN 53571 140%
 - .12 Water Absorption Top Layer 2%
 - .13 Water Absorption Under Layer 20.8%
 - .14 Heat Resistance 0.089 kw/m²

.4 Installation Procedure

.1 Application:

- .1 Resilient underlay shall be bonded to the subfloor surface using approved adhesive applied at a minimum rate of .625 kg/Sq.M., cut neatly around any fixed objects; terminate flooring at centre line of openings where adjacent floor finish or colour is dissimilar.
- .2 Apply sealer at a minimum rate of .5 kg/Sq. M. to the joints and over the entire surface of the resilient underlay.
- .3 Layers shall be applied at a minimum rate of 2.8 kg/sq M and to a total thickness of 2 mm, being applied in two applications so that any irregularities that occur in the first application can be corrected in the second application.
- .4 Apply mat finish at a minimum rate of .15 kg/Sq. M. and allow to cure prior to application of the games lines.
- .5 Games lines shall be laid out and painted in accordance with the approved standards.

.3 Accessories:

- .1 Thresholds: Install thresholds or reducer strips to cover spaces at doorways or changes in floor finishes.
- .2 Resilient Base: Install to walls using adhesive, providing a neat application without deformation.

- .3 Protection:
- .1 Allow a minimum of 72 hours after completion of the floor prior to allowing any access to the area.
 - .2 Should access be required after this period, the General Contractor shall be responsible to protect the floor surface using cardboard or non-fibred kraft paper with joints taped.

5.9.8 RESILIENT SHEET FLOORING

- .1 Products
- .1 Materials
- .1 Linoleum Sheet: to CSA A126.3-M1984, Type II, Grade 1. Flooring to be minimum 2.5 mm thick in rolls of 6-6" minimum width. Design elements shall extend throughout the thickness of the wear layer. Colour to be selected by Architect from the manufacturer's standard range.
 - .2 Sheet Vinyl to ASTM F1303-95, homogeneous non-directional.
 - .2 Base: 4" high coved complete with preformed corners.
 - .3 Primers and adhesives: of types recommended by resilient flooring manufacturer for specific material on applicable substrate, above, on or below grade.
 - .4 Accessories:
 - .1 Reducer strips: Provide 1/8" thick vinyl reducer strips, in same colour as flooring, where sheet flooring terminates.
 - .5 Sub-floor filler and leveller: as recommended by flooring manufacturer for use with their product.
 - .6 Metal edge strips: aluminum extruded, smooth, mill finish with lip to extend under floor finish, shoulder flush with top of adjacent floor finish.
 - .7 Sealer and wax: type recommended by resilient flooring material manufacturer for material type and location.
- .2 Sub-Floor
- .1 Concrete sub-floor must be dry, smooth, free of moisture, oil, dirt, grease and waxes.
 - .2 Remove sub-floor ridges and bumps. Fill low spots, cracks, joints, holes and other defects with sub-floor filler.
 - .3 Prime sub-floor to resilient flooring to resilient flooring manufacturer's printed instructions.
- .3 Flooring Application

- .1 Apply adhesive uniformly using recommended trowel. Do not spread more adhesive than can be covered by flooring before initial set takes place.
 - .2 Lay flooring with seams parallel to building lines to produce a minimum number of seams.
 - .3 Double cut sheet joints and heat weld all seams using welding rods according to manufacturer's printed instructions.
 - .4 As installation progresses, and after installation roll flooring with 75-100 lb. roller to ensure full adhesion.
 - .5 Cut flooring neatly around fixed objects.
 - .6 Install feature strips and heat weld joints.
 - .7 Continue flooring over areas which will be under built-in furniture.
 - .8 Terminate flooring at centre line of door in openings where adjacent floor finish or colour is dissimilar.
 - .9 Install metal edge strips at unprotected or exposed edges where flooring terminates.
- .4 Base Application**
- .1 Set base in adhesive tightly by using minimum 7 lbs. hand roller, against wall and floor surface. Use wood or premanufactured supports behind base.
 - .2 Install straight and level to variation of 1:1000.
 - .3 Scribe and fit to door frames and other obstructions.
- .5 Accessories Application**
- .1 Install reducer strips at terminations of resilient sheet flooring where edges are exposed to view.
 - .2 Install adapter strips where resilient sheet flooring other-flooring meet.
 - .3 At door openings, install reducer strips and adapters under floors.
 - .4 Secure strips and adapters to subfloor with contact bond adhesive to ensure complete bond.

5.9.9 Painting

- .1 The best practices specified or recommended in CAN2-85.100-m81 shall govern for materials, methods and procedures.
- .2 Environmental Requirements
 - .1 Do not apply paint finish in areas where dust is being generated.
 - .2 Ensure that all areas in which paint is applied are well-ventilated and broom clean.

- .3 Do not apply paint unless a uniform minimum 50°F air temperature has been achieved in the installation area for 24 hours prior to and after application.
- 3 Protection
 - .1 Cover or mask surface adjacent to those receiving finish to protect work of others from damage and soii.
- 4 Product Delivery, Storage And Handling
 - .1 Deliver to site each container sealed and labelled with manufacturer's name, catalogue number or brand name, colour, formulation type, reducing instructions, and reference standard specification number if applicable.
 - .2 Store only acceptable project materials at site, and in an area specifically set aside for purpose that is locked, ventilated, maintained at a temperature of over 4°C, and protected from direct rays of sun. Ensure that health and fire regulations are complied with in storage area.
- 5 Products
 - .1 All paint products are to be "Eco-Logo" approved products. Supply appropriate certificate from manufacturer.
 - .2 All paint products must be listed on the CGSB Qualified Products list.
 - .3 Location and Paint:
 - .1 Gymnasium Hardwood Floors:
 - .1 Apply first coat modified urethane thinned 25%.
 - .2 Apply 3 coats modified urethane over gym Court line markings. Apply 3 coats over finish carpentry hardwood.
 - .3 Gym Court Lines: latex - 2 coats.
 - .2 Typical Classroom and Corridor Concrete Block Walls:
 - .1 Latex block filler; 1 coat, applied at 85-90 sq.ft. per gallon.
 - .2 Latex semi-gloss; 2 colour coats. Applied 3 mils dry.
 - .3 Typical Offices and Gypsum Board Walls:
 - .1 Latex primer; 1 coat, applied at 80-90 sq.ft. per gallon.
 - .2 Latex eggshell, 2 colour coats. Applied 3 mils dry.
 - .4 Gymnasium Concrete Block Walls:
 - .1 Heavy duty Epoxy Block Filler; 1 coat.

- .2 Water based epoxy; 2 coats colour. Note that there is to be a variance in colour between coats.
- .5 Kitchen, Cafeteria, Washrooms and Lockers, Concrete Block:
 - .1 Epoxy Block Filler: 1 coat.
 - .2 Water based epoxy; 2 coats colour applied at 2.5 mils per coat.
- .6 Exposed Deck and Structure:
 - .1 Sprayed "Dry Fog" alkyd semi-gloss colour coat: 1 coat.
- .7 Metal Handrails: (interior)
 - .1 1 coat primer.
 - .2 Scrubable gloss latex; 2 colour coats.
- .8 Steel Doors & Frames
 - .1 1 coat primer.
 - .2 Scrubable satin latex; 2 colour coats.
- .9 Wood Base (Typical):
 - .1 1 coat latex primer.
 - .2 Latex semi-gloss; 2 colour coats. Applied 3 mils dry.
- .10 Metal Columns (Exterior):
 - .1 1 coat primer epoxy.
 - .2 Water based epoxy, 2 coats colour.
- .11 Floors (Exposed):
 - .1 2 coats colour on exposed concrete.

.6 Preparation Of Surfaces

.1 General

- .1 Vacuum clean interior areas immediately before finishing work commences.
- .2 Remove from surfaces: grease, oil, dirt, dust, ridges, and other soil and materials that would adversely affect the adhesion or appearance of finish coatings.
- .3 Rust on surfaces primed under work of other Sections shall be removed and the areas reprimed under the Work of these Sections.
- .4 Finish, patch and smooth surfaces to remove cracks, holes, ridges, and similar blemishes.
- .5 Touch-up damaged prime coats on shop primed metals with same priming material. Feather out edges of shop coat and smooth repair coat into shop coat surfaces.
- .6 Scrub mildewed surfaces with a solution of tri-sodium

phosphate, bleach with a solution of one part sodium hypochlorite (Javex) to three parts water, and rinse with clear water.

.2 Gypsum Board:

- .1 Fill minor holes and depressions, caused by accidental damage, with drywall joint compound, and sand smooth when it is set, taking care not to raise nap of paper cover.

.7 Application

- .1 Sand and dust between each coat to remove defects.
- .2 Apply each coat only after preceding coat is dry and hard or as otherwise directed by material manufacturer.

5.10 MISCELLANEOUS SPECIALTIEAS

5.10.1 Visual Display Boards

.1 Warranty

- .1 Submit a manufacturer's warranty of twenty years for all visual display boards.

.2 Communication Boards

- .1 Facings of steel sheet. Porcelain enamel finish for dry, water dampened, erasable markers and chalk. Suitable for use as a projection screen. Unaffected by solvents and reagents. Provide sample for Architect's approval.
- .2 Complete with trim or frame with coloured inserts, map rail, map hooks. Permanent music lines on music room boards (one only). Mounting heights, extent and location as per individual room requirements.

.3 Tackboards

- .1 Generally 1/8" natural cork laminated to 3/8" fibreboard backing. Trim as for communication boards. Mounting heights and extent as per individual room requirement.

.4 Installation

- .1 Install Work to meet requirements of manufacturer's specifications, level and in true planes.

5.10.2 Operable Walls

- .1 **Reference Standards:**
 - .1 ASTM E90-90, Standard Method of Laboratory Measurement of Airborne Sound Transmission loss of Building Partitions.
 - .2 ASTM E413-94, the standard by which the Sound Transmission Class is determined.
 - .3 ISO 140/III 1978(E), Laboratory Measurement of Airborne Sound Insulation of Building Elements.
 - .4 ISO 717, Rating of Sound Insulation in Buildings and of Building Elements, Part 1: Airborne Sound Insulation in Buildings and of Interior Building Elements.
 - .5 CAN4-S102-M83 Surface Burning Characteristics of Building Materials and Assemblies.
- .2 **Qualifications**
 - .1 The installation of the operable wall system shall be carried out only by factory-trained installers.

5.10.3 Toilet Partitions and Bath Accessories

- .1 **Washroom Accessories**
 - .1 Specified manufacturer's catalogue references establish minimum acceptable standards for Work of this Section.
 - .2 Unspecified materials which form a part of complete assemblies shall be of manufacturer's standard.
- .2 **Accessory List**
 - .1 **Paper Towel Dispenser:**
 - .1 Location: one in each washroom
 - .2 Product: Paper towel holder to hold 8" wide x 6" paper towel roll.
 - .2 **Feminine Napkin Dispenser: (all schools except Elementary)**
 - .1 Stainless steel semi-recessed unit including roughing in frame, minimum capacity 15 napkins and 20 tampons, 10 cents operation, key locked, continuous hinge front panel.
 - .2 Location: one in each womens' washroom.
 - .3 **Feminine Napkin Disposal Bin:** 1 in each female toilet compartment
 - .1 Stainless steel, semi-recessed unit including rough-in frame, continuous hinged door, self closing, embossed with "napkin disposal", removable stainless steel receptacles

fitted with spring clip for deodorizer block.

- .4 Toilet Tissue Dispensers:
Location: one at each toilet
Construction: 304 Stainless Steel
Finish: Satin
Mounting: Surface
- .5 Grab Bars:
Location: 2 each washroom and shower
Tube: Minimum. 2 in each accessible shower 1-1/4" dia. 304 stainless steel
Flanges: 3" dia. concealed
Finish: Peened grip, polished ends
- .6 Shower Curtain Rods:
Location: Two each in shower stall
Rod: 1 1/4 diameter, 18 gauge, type 304 stainless steel complete with 2 1/2" square end flanges.
- .7 Shower Curtains:
Location: two each in each shower stall in rooms 110
Material: Opaque, matte white vinyl, 2 mm thick complete with nickel plated brass grommets along top every 6" and stainless steel curtain hooks.
- .8 Shower Seats:
Location: Two each in each barrier-free shower stall in rooms. One each in all other showers.
Material: - 4 wood grain phenolic slats 5/16" x 3"
Type: 304 stainless steel construction
Mounting: Surface mounted, 18" from top of seat to floor
- .9 Tilt Mirrors:
Location: One each over each barrier-free Lavatory.
Frame: Type 304 stainless steel, satin finish.
Glass: 1/4" No. 1 Quality float/plate glass mirror.
Mounting: Surface mounted 44" from bottom of mirror to floor, concealed fasteners.
- .10 Frame Mirrors at sinks:
Location: for every sink except barrier-free sinks
Frame: One piece roll formed, type 304 stainless steel channel with

- satin finish
Glass: 1/4" No. 1 quality float/plate glass mirror
Mounting: Surface mounted on concealed wall hanger and secured with theft-resistant locking screws. Bottom of mirror to floor - 38"
Size: 18" x 24" security mirror.
- .11 Full Length Frame Mirror:
Location: one in each dressing room
Frame: One piece roll formed, type 304 stainless steel channel with satin finish
Glass: 1/4" No. 1 Quality float/plate glass mirror.
Mounting: Surface mounted on concealed wall hanger and secured with theft-resistant locking screws. Bottom of mirror to floor - 12"
Size: 24" x 72", B290 2472
- .12 Soap Dish:
Location: One in each shower stall
Mounting: Recessed with anchor lugs
Construction: Heavy duty stainless steel, satin finish
- .13 Towel Bars:
Location: One in each dressing compartment of shower stalls. One outside each gym instructor's shower
Bar: 18 gauge, type 304, stainless steel satin finish
1" diameter x 18" long
Mounting: Concealed mounting plate
- .14 Robe Hooks:
Location: One in each dressing compartment of shower stalls. One on inside of each gym instructors washroom door
Construction: One piece brass casting with satin nickel plated finish
Mounting: Locks to wall plate for theft proof mounting
- .15 Custodial Accessories:
Location: one each in janitor room
Construction: 18 ga. type 304, stainless steel, satin finish
Shelf with mop holders and rag hooks; 4 holders, 3 hooks 36" length
- .16 Hand Dryer:
Location: one in each change room
- Two position air outlet nozzle
- Vandal resistant grille

- Concealed vandal resistant mounting screws
- 208 volt
- Mounting height: 38"

3 Toilet Partitions

- .1 Plastic laminate construction
- .2 Laminated plastic sheet, solid colours over core material. floor mounted, overhead braced. Self closing door for use by handicapped.
- .3 Laminated Plastic Sheets. to CAN3-A172, with solid colour pattern, satin finish.
- .4 Core Material: particle board to CAN3-088.1, Grade H sanded both faces.
- .5 Laminated Plastic Adhesive: adhesive to CSA 0112 Series.
- .6 Stainless Steel Sheet Metal: to ASTM A167, Type 304 with satin finish.
- .7 Fasteners: stainless steel tamperproof type screws and bolts.
- .8 Sealer: water resistant sealer or glue as recommended by laminate manufacturer.
- .9 Headrails: clear anodized, extruded aluminum, anti-grip design.
- .10 Pilaster shoe stainless steel 3" high.
- .11 Hardware:
 - .1 Hinges:
 - .1 Heavy duty, self-lubricating, nylon bushings.
 - .2 Material/Finish: stainless steel.
 - .3 Swing: inward and outward.
 - .4 Return Movement: gravity.
 - .5 Adjustable to hold door open at any angle up to 90 deg.
 - .6 Emergency access
 - .2 Latch Set: surface mounted combination latch, door-stop, chrome plated non-ferrous, stainless steel, emergency access feature.
 - .3 Wall and Connecting Brackets: stainless steel extrusion or casting.
 - .4 Coat Hook: combination hook and rubber door bumper, stainless steel.
 - .5 Door Pull: Barrier-free type suited for outswinging doors, stainless steel.
- .12 Fabrication
 - .1 Include reinforcing, anchorage and mounting devices required for the installation of each product.
 - .2 Fit joints and junctions between components tightly and in

- .3 true planes, conceal and weld joints where possible.
- .3 Fabricate products with materials and component sizes, metal gauges, hardware, reinforcing, anchors, and fastenings of adequate strength to ensure that Work will remain free of warping, buckling, opening of joints and seams, and distortion within limits of intended use.
- .13 Installation
 - .1 Provide manufacturer's handling instructions, anchorage information, roughing-in dimensions, and templates for installation of Work of this Section.
 - .2 Install Work only as specified by manufacturer.
 - .3 Verify location and mounting heights of products with Architect before roughing-in or installation.
 - .4 Install Work plumb, level, straight, tight and secure to mounting surfaces, and centered between joints on masonry and tile walls.
 - .5 Attach accessories to walls with only:
 - : 1 1/2" long expansion shields in solid masonry or in concrete
 - : toggle bolts in cells of hollow masonry units
 - : sheet metal screws into metal framing at metal stud partitions
 - : wood screws into wood framing
 - .6 Use only fasteners that match material and finish of fastened Work where exposed to view.
 - .7 Ensure that grab bars are installed to withstand a minimum downward force of 900 lbs. per grab bar.

5.11 ELEVATORS

5.11.1 Hydraulic Elevators

- .1 Reference Standards:
 - .1 Do hydraulic elevator work to CSA B44-M94 local codes and regulations except where specified otherwise.
- .2 Description of Systems
 - .1 Provide one holeless hydraulic passenger elevator as follows:
 - .1 Car inside 6'-8" wide x 4' -3" deep, front to back, overall
 - .2 Rated load: 2500 lbs. exclusive of complete car and plunger
 - .3 Travel: as required
 - .4 Openings: as required

- .5 Speed: 100 f.p.m. in up and down direction with rated load and with maximum speed. Variation +/- 5% no load to rated load.
- .3 Two-Stop Automatic Operation
- .1 Include two-stop automatic elevator operation, as follows:
- .1 Provide flush mounted operating device in car with stainless steel faceplate containing push buttons marked to correspond with two landings served, emergency stop switch, light switch arranged for restricted operation, door open button and alarm button.
- .2 Arrange operation so that momentary pressure of car button for opposite terminal dispatches car to the terminal.
- .3 Allow call registered by momentary pressure landing buttons at any time to remain registered until car stops in response to that call at that landing.
- .4 If hoistway door is not opened within short interval after car has stopped at terminal, arrange car to respond to call from other terminal.
- .4 Security Operation
- .1 Include a security feature to operate as follows:
- .1 Include in each hall pushbutton station a spring return keyed switch and a normal pushbutton.
- .2 At the upper floor include a two position keyed switch (keyed differently) with the key removable in the "On" and "Off" position.
- .3 When the system is turned "On" it will be necessary at either floor to use the spring return key to place a hall call. When the system is turned "Off" the hall push buttons will operate normally; without requiring the use of the key switches.
- .5 Car Stall Protective Circuit
- .1 Automatically return car to bottom landing and open power operated doors if car should stall as result of relay failure, valve failure or low oil in system while ascending. Restore service by opening and reclosing main line switch.
- .6 Emergency Operation
- .1 Include means to automatically return the elevator to the lowest landing upon failure of normal power supply. Include door operation.

- .7 Two-Way Levelling
- .1 Include automatic two-way levelling device. Approach landing stops at reduced speed from either direction of travel.
 - .2 Level with accuracy of 1/4" under varying load conditions.
- .8 Performance
- .1 Design and adjust equipment as follows:
 - .1 Provide smooth acceleration and deceleration of car without perceptible steps so adjusted as not to cause passenger discomfort.
- .9 Use by Handicapped
- .1 Comply with CSA-B44--M94 Appendix E. Standards for Handicapped, Section 3.5 and the following:
 - .1 Locate upper most button in elevator cab control panel and centre-line of telephone instrument not more than 4'-6" above floor level.
 - .2 Furnish 2" wide x 1/4" thick solid stainless steel handrails on the side and rear walls of car with ends returned close to panels.
 - .3 Sound audible soft-toned signal in car when car is stopping at a floor.
 - .4 Provide car riding lanterns with gongs which sound once for "up" stops and twice for "down" stops.
 - .5 Provide Arabic numerals 5/8" in height raised 1/32" immediately to left of floor buttons.
- .10 Components
- .1 Use major elevator components from standard product line of one manufacturer unless otherwise approved.
- .11 Emergency Lighting
- .1 Include emergency lighting in car as follows:
 - .1 Use battery operated emergency lighting equipment, to CSA C22.2 No. 141-1972, to provide general illumination and 10 lx minimum illumination in car at operating panels and telephone cabinet for four hours minimum.
 - .2 Include means for convenient manual operation and testing of each unit from within car.
 - .3 Include means of containing any leakage or spillage of electrolyte.

- .12 Passenger Car Enclosure
- .1 Include overall fluorescent ceiling lighting using rapid start, high power factor ballasts, sound rated A, with plastic diffuse panels supported on baked enamel hung type ceiling frame. Design for light intensity measured 2'-6" above floor of 215 1x maximum. Totally enclose and conceal wiring and ballasts from view within the car and finish ceiling cavity white.
 - .2 Fabricate front return panels, soffit and entrance columns of integral stainless steel.
 - .3 Provide pad hooks.
 - .4 Include telephone cabinet in car with approved telephone symbol. Identify elevator and name of building on back of cabinet cover. Include telephone wiring within elevator hoistway to machine room.
 - .5 Fabricate side and rear cab walls of one piece wood core faced in plastic laminate.
 - .6 Use bolts fitted with washers and lockwashers and fabric separators, if necessary, to assemble and guarantee entire structure to operate entirely free from squeaks and metallic sounds.
 - .7 Provide 7'-4" clear heights under fixed hung car ceiling.
 - .8 Provide clear car entrance height of 7'-0".
 - .9 Finish car doors stainless steel.
 - .10 Furnish stainless steel license holder in elevator car to suit certificate issued by enforcing authority. Design holder with hidden or tamperproof fastening.
- .13 Door Protective Device
- .1 Include door protective device extending full height of clear opening and projecting beyond leading edge of each door panel.
 - .2 Should this device touch person or object while car door is closing, return car and hoistway doors to open position.
 - .3 Arrange to retract noiselessly at both limits of travel.
 - .4 Design and adjust to cause doors to stop and reopen before doors contact object or person.
- .14 Light Ray Device
- .1 Include additional door protection by means of an infra-red multi-beam array of up to 50 beams projected across elevator car entrance.
 - .2 After stop is made, hold doors open for predetermined adjustable interval, unless closing is initiated sooner by registration of car call.

- .15 **Fire Rated Entrances**
- .1 Provide fire protection rated elevator closures, produced under label service program of ULC or other agency acceptable to DFC and authorities having jurisdiction.
 - .2 Affix ULC or other acceptable agency label to elevator closures.
- .16 **Field Quality Control**
- .1 Perform and meet tests required by CSA-B44-M94.
 - .2 Supply instruments and carry out additional specified tests.
 - .3 Furnish test and approval certificates issued by jurisdictional authorities.
 - .4 Provide 2 weeks written notice of date and time of tests.

6.0 MECHANICAL OUTLINE



6.1 GENERAL: MECHANICAL DESIGN REQUIREMENTS

.1 Intent

- .1** This Mechanical Outline is for Schools financed, designed, built, operated and maintained by the Private Sector.

.2 Codes, Regulations and Standards

- .1** The most stringent requirements of local municipal by-laws, provincial codes and following codes and standards shall be followed.
- .2** In no instance shall the Standard established by this Mechanical Outline Document be reduced by the application of any other codes.
- .3** AMCA 99-1986, Standards Handbook.
- .4** ASHRAE Handbooks and Standards.
- .5** CSA B51-M97, Boiler, Pressure Vessel, and Pressure Piping Code.
- .6** CSA B52-95 Mechanical Refrigeration Code.
- .7** CSA C22.1-98, Canadian Electrical Code, Part 1 Safety Standard for Electrical Installations.
- .8** CAN/CGA B149.1-M95, Natural Gas Installation Code.
- .9** CAN/CGA B149.2-M95, Propane Installation Code.
- .10** CAN/CSA-B139-M91, Installation Code for Oil Burning Equipment.
- .11** Industrial Ventilation Manual by the American Conference of Governmental Industrial Hygienists.
- .12** National Building Code of Canada - 1995.
- .13** National Plumbing Code of Canada - 1995.
- .14** National Fire Code of Canada - 1995.
- .15** NFPA 13-1994 Installation of Sprinkler Systems.
- .16** NFPA 14-1993 Installation of Standpipe and Hose Systems.
- .17** NFPA 17A-1990 Wet Chemical Extinguishing System.
- .18** NFPA 20-1993 Installation of Centrifugal Fire Pumps.
- .19** NFPA 22 Water Tanks for Private Fire Protection.
- .20** NFPA 24 Standard for Installation of Private Fire Service Mains and their Appurtenances
- .21** NFPA 96-1994 Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations.
- .22** Nova Scotia Department of Environment- Petroleum Storage Regulations.
- .23** SMACNA HVAC Duct Construction Standards - Metal and Flexible, 1985.
- .24** SMACNA Air Duct Leakage Test Manual, 1985.

.3 System Selection and Design Criteria

- .1** Be simple, proven systems selected to provide maximum reliability and maintainability with consideration for the availability of parts and service.

- .2 Be installed with adequate space for proper maintenance. See section "Accessibility for Operation and Maintenance".
- .3 Have adequate provisions for testing, adjusting and balancing (TAB) and all other phases of commissioning.
- .4 Be fail-safe with all equipment of a quality consistent with anticipated building life expectancy and/or required reliability of service.

.4 Environmental Conditions

- .1 Refer to Section 3.5 for Acoustical Criteria.
- .2 Unless otherwise indicated base occupancy on the following:

| | |
|--|-----------------------------------|
| Classrooms Groupings | 1 occupant per 25 ft ² |
| Laboratory Classrooms | Equivalent to a Classroom |
| Arts | Equivalent to a Classroom |
| Technical Education and Family Studies | Equivalent to a Classroom |
- .3 Temperature in a Sound Booth should not exceed 25° C.

.5 Layouts of Mechanical Systems

- .1 All piping, ducting and other services, except gas piping and fuel oil lines, shall be concealed in ceilings, chases, shafts, furred out spaces or partitions. This shall not apply in mechanical equipment rooms, basements or storage spaces not occupied by personnel.
- .2 Piping and ductwork shall not be installed in any space used as an electrical switchgear or transformer room or electrical closet.
- .3 Piping or ductwork shall not be installed above motor control centres or surface mounted panel boards, etc.
- .4 Water and waste pipes shall not be installed in exterior wall.
- .5 Pipes, ducts and other utilities shall not be embedded in fireproofing or any column or other structural member. Neither shall they run between the fireproofing and the structural member so protected.

.6 Water Supplies

- .1 Every building shall be provided with a reliable and adequate water supply available to fire department mobile pumping apparatus, building fire protection systems and potable domestic water.
- .2 Potable Domestic Water Supply System:
 - .1 The minimum water pressure required for plumbing fixtures on the top floor of a building is 20 psi except for flush valves which require 25 psi minimum.
 - .2 Conform to Guidelines for Canadian Drinking Water Quality Standards.
- .3 Fire Protection Water Supply Sources:
 - .1 In areas where there is no established water supply, but due to features of construction and occupancy, a water supply for a

system of fire hydrants, sprinklers, etc., may be required. Water supply sources may consist of a connection to a public or private water main system, gravity tank, compartmentalized reservoir and fire pumps, rivers, lakes, etc.

- .2 In areas where there is no established water supply and an outside hydrant system is not required, a water supply for a system for an internal fire hose and standpipe system sprinklers may be required. Water supply sources may consist of a pressure tank or a non-pressurized source, such as a reservoir, cistern or tank with a pumping system.

.7 **Boiler Rooms, Chiller Rooms and Mechanical Equipment Rooms**

- .1 Locate all mechanical equipment, including but not limited to air handling(HVAC) units, boilers, chillers, etc. in mechanical rooms or mechanical penthouses.
- .2 Mechanical penthouses shall be accessible by a permanent stair access without crossing the roof.
- .3 Boiler rooms shall be separate from, but may be adjacent to, mechanical equipment rooms containing air handling equipment, so as to eliminate any possibility of fumes from faulty combustion equipment entering any HVAC system.
- .4 In determining sizes of boiler rooms, chiller rooms and mechanical equipment rooms, consideration shall include, but not necessarily be limited to, minimum requirements for installation, maintenance, servicing, removal and replacement of mechanical equipment.
- .5 Consideration should be given to providing separate rooms for boilers and chillers. This will reduce the construction costs to satisfy code requirements for fire separation between the boiler room and the remainder of the building.
- .6 Some of the criteria which will affect consideration of locations include, but are not necessarily limited to, the following:
 - .1 Proximity to heating and cooling loads and requirement to minimize energy transport factors.
 - .2 Accessibility for installation, operation, maintenance, servicing, removal and replacement
 - .3 Isolation of noise and vibration generating equipment from conference rooms, audio facilities and other sensitive areas.
 - .4 Quality of outside air and location of outside air intakes.
 - .5 Quality of air to be exhausted and location of exhaust air terminals.
- .7 All flammable or combustible materials, not directly related to the furnace or boiler shall be kept and handled in separate rooms.

.8 Rooftop Equipment

- .1 See Boiler Rooms, Chiller Rooms and Mechanical Equipment Rooms above.
- .2 The installation on the roof of any mechanical equipment which requires maintenance of any sort shall be considered as the least desirable of all alternatives.
- .3 Consider the following factors when locating rooftop mechanical equipment, including but not limited to roof exhaust fans and heat rejection equipment.
 - .1 Snow accumulation; the vertical distance between the roof surface and the underside of the equipment shall be at least 30 inches, and more when drifting of snow may be anticipated.
 - .2 Integrity of the roof waterproof membrane; this will normally require the installation of sleepers to support the equipment; all penetrations of the waterproof roofing membrane shall be properly designed, flashed and sealed.
 - .3 Safety of maintenance personnel; this will normally require walkways, railings and other safety features, as well as maintenance platforms.
 - .4 Noise from the equipment causing disturbance and annoyance to occupants of nearby properties.
 - .5 Exposure to ambient conditions; heat losses from, or heat gains to, the equipment may be greater than for similar equipment installed in a mechanical equipment room.

.9 Accessibility For Operation and Maintenance

- .1 Elements of equipment shall be located so that they can be serviced or replaced without dismantling any other services or elements.
- .2 All mechanical equipment and components shall be located so as to be readily accessible for servicing and maintenance, and so as to be easily isolated, removed and replaced.
- .3 Maintenance and servicing of mechanical equipment and services shall be performed without undue interference with normal work performed by the building occupants.
- .4 Space for tube bundle withdrawal and cleaning of tubes shall be provided. Layouts shall be arranged so that no other piece of equipment need to be disturbed nor systems shut down when withdrawal or servicing is carried out.
- .5 Mechanical rooms layouts and space requirements for maintenance and servicing (for example, tube withdrawal space) shall be sufficient so as to permit all qualified manufacturers and suppliers to participate in competitive bidding.

- .6 Where possible, all piping connections, filter access, electrical wiring connections, motor and drive shall be on the same side of the equipment.
- .7 Minimum clearance around each item of equipment for servicing, maintenance, removal and replacement shall be the greater of either 48" or 20" plus the size of the largest replacement component (whichever is larger). For example:
 - .1 Space around filter bank - 20 inch plus size of largest filter unit.
 - .2 Space around pump - 20 inch plus size of motor or pump.
- .8 In addition, adequate space shall be provided all around each item of equipment for operation, maintenance and servicing, such as boiler and chiller tube cleaning, withdrawal and replacement, firetube boiler and door swing space, heating converter and domestic hot water storage heater tube bundle withdrawal.
- .9 Equipment Piping Connection:
 - .1 Provide piping with isolating shut-off valves, so that servicing of components does not interfere with the building services.
 - .2 Piping connections shall be arranged so that the component can be isolated, removed and replaced simply by dismantling unions or flanges on the equipment in question, without disturbing, dismantling or shutting down any other services.
 - .3 All control valves and tempering valves to be installed with flanges or unions.
- .10 Electrical equipment:
 - .1 Minimum clearances around each item shall be subject to electrical code requirements.
- .11 Access doors and panels:
 - .1 All equipment and system components requiring servicing, inspection or adjusting must be easily accessible. Where equipment may be required to be removed for repair or servicing, adequate access must be provided.
 - .2 Where equipment or system components are concealed in furred ceiling or in walls or partitions, Provide access doors.
 - .3 Access doors or panels shall be installed wherever valves, water hammer arrestors, plumbing cleanouts, trap primers, drain points, automatic and manual air vents, controllers, controlled devices, duct access doors and panels, etc., are not accessible.
- .10 Standby and Redundancy
 - .1 Selection of equipment shall be based on the most economical sharing of the design load by two or more units and on the need for standby.
 - .2 Standby capacity and redundancy of units should be considered when stability of environmental conditions is so critical that a change can

cause irreparable damage or irrecoverable loss or where availability of spares or of service is less than immediate.

.11 **Space Heat**

- .1 Space heat to be independent of air distribution systems.
- .2 Heat distribution units mounted less than 7'0" above finish floor shall have a maximum surface temperature 120°F (50°C).

.12 **Heat Generators**

- .1 Boilers should be sized so that in the event of a boiler failure, the remaining boiler or boilers can maintain near design temperature at 97.5% design conditions when service hot water are shut off and outside air is reduced to the minimum required to counter infiltration.
 - .1 Generally, for in-house plants this policy can be satisfied by providing two boilers each capable of providing for 2/3 of the design load. In case of central heating plants, each boiler of a two boiler installation should be sized to satisfy the design load.
 - .2 A summer boiler is to be considered along with alternatives where the summer load is below the minimum safe turn down ratio of the smallest winter boiler.
 - .3 Where three boilers are economically justified, two boilers together should be able to carry the design load, one boiler acting as a standby.

.13 **Electric Heating**

- .1 Electric resistance heating will only be considered where an owning and operating cost advantage is indicated by a comparative cost study of alternative heating systems.
- .2 Electrical heating systems shall have, a high temperature cut-out that will automatically discontinue current to the heating elements if the temperature exceeds the maximum safe limits.

.14 **Cooling Equipment**

- .1 For cooling load of over 500 tons the down time justifies splitting the load into two machines.
- .2 Under 500 ton load a multiple installation should be justified by an analysis of capital investment, operating cost, energy conservation and the cost of down time loss.

.15 **Heat Recovery**

- .1 Where high ventilation rates are required provide heat recovery systems.

.16 **Bases**

- .1 Mount base mounted equipment on chamfered edge housekeeping pads.
 - .2 Ensure bases are level prior to placement of equipment.
- .17 Motors**
- .1 Use 1750 rpm, motors manufactured for 40⁰C temperature use.
 - .2 Adjustable frequency A/C motor drives, motors to be Definite Purpose Invertor Fed Motors in accordance with NEMA MG1.1993 Rev 3 Part 31.
- .18 Belt Drives and Guards**
- .1 Provide guards for unprotected drives.
- .19 Sleeves:**
- .1 Sleeves for all points where pipe passes through walls or floors.
 - .2 Unless otherwise specified, terminate sleeves flush at walls and ceilings, 2" above floors in all mechanical rooms and 1" in all wet areas. This does not apply to concrete floors on grade.
 - .3 Fill voids between sleeve material and pipe:
 - .1 Where pipes pass through fire-rated walls, floors and partitions maintain fire rating integrity firestop between pipe and sleeve.
 - .2 Where pipes pass through non fire-rated walls, floors and partitions caulk between pipe and sleeve.
 - .3 Where ducts pass through fire-rated walls, floors and partitions maintain fire rating integrity.
- .20 Testing**
- .1 All piping systems shall be pressure tested.
- .21 Flushing and Cleaning**
- .1 After pressure tests are completed and approved, prior to start-up and placing into operation, flush and clean out all piping systems.
- .22 Identification**
- .1 Manufacturers' Nameplates: mechanically fastened to each piece of equipment.
 - .2 Systems Nameplates: mechanically fastened to each piece of equipment.
 - .3 Pipe Identification: Medium in piping to be identified with markers or stencils showing name and service, including temperature and pressure and directional flow arrows where relevant.
 - .4 Duct Identification: Show fan system number on ducts .
 - .5 Valves: tags all valves and operating controllers.

6.2 SOUND ATTENUATION

.1 General

- .1** Aim of noise and vibration control: To ensure that mechanical equipment and systems operate at the lowest sound and vibration level consistent with the functional requirements of the project.

.2 Equipment Isolation

- .1** All fans and air handling units not internally isolated shall be isolated from the building structure by means of isolators.
- .2** Floor mounted vertical inline pumps and base mounted pumps over 7.5 hp, all air compressors over 5 hp and chillers shall be isolated from the building structure by means of spring isolators and unit inertia base.
- .3** All air compressors up to and including 5 hp shall be isolated from the building structure by means of spring isolators.
- .4** Electrical to vibration isolated equipment shall be flexible connections.
- .5** Non-vibrating equipment in mechanical equipment rooms such as storage tanks and hot water converters which are connected to vibrating equipment via piping, etc., shall be isolated from the floors with elastomeric pads.

.3 Pipe Isolation

- .1** Flexible pipe connections shall be installed at all pipe connections to vibration isolated equipment.
- .2** All piping within mechanical rooms or within 50'-0" total pipe length (whichever is longer) connected to vibration isolated equipment (pumps, air handling units, etc.) shall be isolated from the building structure by means of vibration isolation mounts, resilient pipe guides, and resilient penetration sleeve/seals.
- .3** Where lateral support of pipe risers are required within the specified limits this shall be accomplished by use of resilient lateral supports.
- .4** Pipes within the specified limits that penetrate the building construction shall be isolated from the building structure by use of unit resilient penetrating sleeve/seals.
- .5** Parallel running pipes may be hung together on a trapeze which is isolated from the building. Isolator deflections must be the larger determined by the provisions for pipe isolation. Do not mix isolated and non-isolated pipes on the same trapeze.

.4 Duct Silencers

- .1** Use in lieu of acoustic duct liner.

6.3 MECHANICAL INSULATION

.1 Pipe Insulation

- .1 Insulate all piping less than 55°F (13°C) and more than 104°F (50°C)
- .2 Provide insulated piping less than 55°F (13°C)
- .3 Insulation covers for all valves over NPS 2 including control valves and strainers shall be removable cloth covered flexible insulation complete with metal clips.
- .4 Calcium silicate to be provided under all insulation protection shields.

.2 Duct Insulation

- .1 Insulate all ducts which pass through unconditioned areas.
- .2 Insulate all ducts where the temperature difference between the space where the duct is located and the design air temperature of the air carried by the duct exceeds 9°F (5°C).
- .3 Insulate outside air from intake to unit.
- .4 Insulate exhaust air ducting for 10' from exhaust fan or louver except kitchen exhaust duct.
- .5 Insulate exhaust air discharge from heat recovery unit.

.3 Equipment Insulation

- .1 Insulate all equipment less than 55°F (13°C) and more than 104°F (50°C).

.4 Finish

- .1 All exposed insulation with ULC listed plain weave, cotton fabric, 8 oz. canvas and lagging adhesive.

6.4 FIRE PROTECTION

.1 General

- .1 The materials, equipment and assemblies shall meet the minimum requirements of Underwriters Laboratories of Canada.
- .2 Unless prohibited by municipal by-laws, feed the fire hose and standpipe system and sprinkler systems from a common header, and use the same siamese connections for both the standpipe and sprinkler systems.
- .3 No water main supplying a hydrant system is to be less than NPS 6 diameter. Dead-ended mains are to be avoided where possible by looping of mains. Sectional valves are to be installed so that the majority of hydrants may remain in service during a water outage caused by a break or maintenance.

.2 Fire Hose and Standpipe Systems

.1 Fire Hose cabinets:

- .1 In basements and penthouses and similar areas where appearance is not a factor, may be surfaced mounted type.
- .2 Use recessed type elsewhere.

.3 Fire Pumps

- .1 Where required to meet flow requirements.

.4 Pipe and Joints

.1 Steel Pipe to ASTM A-53/A-135/A-795 Grade B.

.2 NPS 2 and Smaller Pipe Joints:

- .1 Schedule 40: Screwed, Victaulic, Grinnel or Couplex Roll Grooved Couplings or Victaulic F.I.T.
- .2 Schedule 10: Victaulic, Grinnel or Couplex Roll Grooved Couplings or Victaulic F.I.T.
- .3 Schedule 5: Victaulic Pressfit System.
- .4 Non-Threaded Dynaflow: Victaulic F.I.T.

.3 NPS 2½ up to NPS 8 Pipe Joints:

- .1 Schedule 40: Welded, Flanged, Victaulic Roll Grooved Couplings.
- .2 Schedule 10: Victaulic Roll Grooved Couplings

.4 NPS 8 and Larger Pipe Joints:

- .1 Schedule 30/40: Welded, Flanged, Victaulic Roll Grooved Couplings
- .2 Schedule 10, Victaulic Roll Grooved Couplings

.5 Where rolled grooved couplings and fittings are used they shall be of the same manufacturer.

.6 All piping shall run concealed in finished areas.

.5 Finish

.1 Provide chrome plated sprinkler heads, valves, nozzles, fittings, except in unfinished areas, where brass finish is acceptable.

.6 Flow and Supervisory Stations

.1 Provide supervised shut-off valves and electric supervisory flow switches, for elevators, kitchen hoods and any areas requiring zoning.

.7 Backflow Preventer

.1 Provide as per Municipality requirements.

6.5 PLUMBING

.1 Storm, Sanitary and Vent Piping

- .1 Above Ground Storm, Sanitary and Vent**
 - .1 Type DWV Copper**
 - .2 Cast Iron to: to CAN/CSA-B70.**
 - .3 ABS or PVC DWV with cast iron stacks for buildings more than one storey.**
- .2 Urinal piping and associated vent pipe to 4' AFF:**
 - .1 Cast Iron to: to CAN/CSA-B70.**
 - .1 NPS 2 tapped cast iron TY with threaded nipple. Brace TY to wall.**
 - .2 ABS or PVC DWV**
- .3 Buried Sanitary & Storm**
 - .1 Cast Iron to CAN/CSA B70 with Hub & Spigot Joint.**
 - .2 ABS or PVC DWV.**
- .4 Sanitary Serving Kitchen or Boiler Room**
 - .1 Cast Iron to: to CAN/CSA-B70.**

.2 Service Water Pipe

- .1 Cement mortar lining for ductile iron pipe: to ANSI/AWWA C104/A21.4.**

.3 Domestic Hot, Cold and Recirculation Tubing, within Building

- .1 Above ground: copper tube, hard drawn, type L: to ASTM B88.**
- .2 Buried: copper tube, soft annealed, type K: to ASTM B88. In long lengths and with no buried joints.**
- .3 Copper pipe NPS 2½ and larger: roll grooved couplings complete with EPDM flush seal gaskets.**
- .4 Mechanically Formed Tee Connections: Mechanically extracted collar shall be formed in continuous operation, consisting of drilling a pilot hole and drawing out the tube surface to form a collar having a height of not less than three times the thickness of a tube wall. The collaring device shall be fully adjustable to ensure proper tolerance and complete uniformity of the joint. Tee connections can be used on one (1) inch and above water pipe and where the branch line connection to the branch main is at least one (1) pipe size smaller than the branch main.**
- .5 Ball valves to be used for shut-off applications on piping up to and including NPS 2.**
- .6 Circuit Balancing valves to be used where balancing is required.**
- .7 Provide drains at low points of all services piping and provide hose end drain with cap and chain. No water from any drain or relief valve shall discharge on floor. Pipe drains from air receivers, hot water tanks, etc.,**

- to hub drains. Where this is impractical lengths of hoses with fittings and adapters may be used.
- .8 Prohibited Locations: No water piping shall be placed in floor fills, structural slabs over ornamental suspended ceilings, in transformer vaults, or over switch boards or electrical panels.
- .4 **Domestic Hot Water**
- .1 Nominal 120°F (50°C) and available during the occupied hours.
- .1 Fed to lavatories, janitor service sinks, showers and sinks.
- .2 Domestic Hot Water Generation Station shall be sized for maximum demand and line loss to deliver 115°F (46°C) water at the most remote faucet.
- .2 Nominal 140°F (60°C).
- .1 Fed to kitchen.
- .2 Where practical, this generating station should be a booster fed from standard Domestic Hot Water Generating Station.
- .3 Provide Domestic Hot Water recirculation pipes where hot water supply pipe or pipes exceeds 100 feet.
- .5 **Sewage Pumps**
- .1 General: Only the facilities which cannot drain by gravity to the main sewer, shall be connected to the sump pit.
- .2 Equipment for Raising Sewage: Use duplex sewage pumps with automatic transfer switch.
- .3 Provide high water alarms in each sump pit.
- .6 **Water Supply System**
- .1 A pressure-reducing valve or valves, relief valve and strainer shall be installed on the domestic water mains wherever a pressure in excess of 60 psi may be expected.
- .2 Service lines must enter the building in an accessible location. They must never enter in fuel rooms, storage rooms, switchgear rooms, or transformer vaults.
- .7 **Plumbing Specialities**
- .1 All plumbing specialities (other than gaskets) shall be metallic.
- .2 Floor Drains:
- .1 Keep numbers and types to a minimum.
- .2 Trap primers are required with washroom floor drains. For other drains where loss of trap seal will occur through evaporation show trap primers.
- .3 Cleanouts: As per code.
- .4 Roof Drains:

- .1 Provide controlled flow weir roof drains where required by the local municipality.
 - .2 Make provision for Rain Water Leader thermal expansion.
 - .5 Vacuum Relief Valves: for each Domestic hot water system.
 - .6 Back Flow Preventers:
 - .1 Protect entire water distribution system against contamination due to backflow from non-potable sources with reduced pressure type backflow preventers.
 - .2 Provide each connection to fixture or equipment for which approved air gap or vacuum breaker is not shown or specified elsewhere in connection with fixture or equipment itself with a backflow preventor.
 - .3 Use continuous pressure type where a valve may used downstream of backflow preventer.
 - .7 Backwater Valves:
 - .1 Where required by the local municipality.
 - .2 Where subject to backflow.
 - .8 Hose Bibbs: complete with backflow protection in all mechanical rooms.
 - .9 Wall hydrants:
 - .1 Installed so that any part of the exterior of the building may be reached with 100 feet of hose without having the hose across the entrance to the building. Wall hydrants shall be non-freeze of self-draining type. complete with backflow protection.
 - .10 Pressure Reducing Valve.
 - .1 On main water supply, where required by the local municipality.
 - .2 Where pressure exceeds connected equipment rating.
 - .3 Where recommended by equipment manufacturer
 - .11 Water Hammer Arrestors as required to prevent water hammer.
 - .12 Trap Seal Primers:
 - .1 Provide electronic trap priming device to all floor drains so that device will introduce regulated amount of water into trap on a time schedule.
 - .13 Grease Interceptors at pot sinks.
 - .14 Sediment Interceptors at art room sinks.
- .8 **Plumbing Fixtures and Trim**
- .1 Use water conserving fixtures.
 - .2 Heavy duty trim for institutional use.
 - .3 Chrome plated exposed plumbing brass and metal work
 - .4 Do not provide compression NPS 3/8 chrome valves. Solder or screwed.
 - .5 Provide union connections at all faucets.
 - .6 All joints at walls, floors and plumbing fixtures to be caulked.
 - .7 Barrier free where required.

- .8 Floor mounted water closets may be used in private washrooms where it is impractical to use wall mounted fixtures, for other installations use wall mounted fixtures on carriers where possible.
- .9 Urinals:
 - .1 Electronic flush valves.
- .10 Lavatories:
 - .1 Mount in a vanity where possible.
 - .2 Waste stoppers are generally not required, use open grid stainlers.
 - .3 Use of overflows is discouraged.
- .11 Electronic faucets with mixing valve for public washrooms.
- .12 Fixture Carriers:
 - .1 Select carriers to support fixtures without strain on piping.
- .13 Equipment Room Sink:
 - .1 A sink is required in each mechanical room for maintenance of equipment.

.9 Chemistry and Biology Laboratory Fixtures and Fittings

- .1 The rooms with corrosive wastes shall be grouped together, where practical.
- .2 Sinks to be Acid Resistant with gooseneck faucet having serrated tip or hose thread with integral vacuum breaker.
- .3 Corrosive wastes shall be kept separately and shall discharge into sanitary system through a dilution tank.
- .4 Corrosive waste system vents shall extend at least 12" above overflow level of sinks where vents join building sanitary system vents.

.10 Drinking Water Systems

- .1 - Provide drinking fountains in all buildings. If domestic water temperature exceeds 55°F (13°C) for two months in the year, provide mechanical cooled fountains.
- .2 Drinking fountains shall be located so that travel distance is not more than 100 feet to reach a fountain. Normally, one fountain located in corridor per group of male and female washrooms is adequate.
- .3 Entrance Lobbies: Drinking water shall not be provided in entrance lobbies.

.11 Liquefied Petroleum (LP) Gas and Natural Gas

- .1 The installation shall be in accordance with CGA Standard B149.1 and B149.2 subject to the design approval and inspection of the Provincial authority having jurisdiction.

.12 Flushing & Chlorinating

- .1 Water service pipes both exterior and interior shall be flushed and disinfected.

6.6 HYDRONICS

.1 Hydronic Piping Systems

- .1 Zone for most economical sizes and flow arrangements, and for effective thermostatic control of space temperatures.
- .2 Give preference to the two pipe reverse return system.
- .3 For large hydronic systems and major equipment, consider the advantages of primary-secondary pumping applications.

.2 Fuel Oil Systems

- .1 Above ground exterior oil storage tank with double wall and interstitial space monitoring system.
- .2 Piping:
 - .1 Above grade oil lines: Schedule 40 Steel Pipe to ASTM A-53 Grade B with socket weld fittings.
 - .2 Below grade oil lines: Dual wall continuous polyethylene piping installed within minimum 4" continuous flexible secondary containment pipe.
- .3 Fusible link shut off valve on suction line.
- .4 On return line, check valves only.
- .5 Anti-siphon devices on each supply line to the boiler where applicable.
- .6 Electronic inventory management and leak detection system providing the following:
 - .1 Automatic continuous leak sensing for tank interstitial space and sumps.
 - .2 Alarm for High Product, Low Product and High Water.
 - .3 Integral report printer.

.3 Hot Water Boilers

- .1 Fire Tube or Cast Iron Sectional.
- .2 Burners: LO-HI-LO oil fired.

.4 Breeching

- .1 Connect breeching to boilers using a flanged connection.
- .2 Connect boiler smoke stacks to breeching at 45°. Connect breeching to chimney with 45° elbow.

.5 Pipe and Joints

- .1 Steel Pipe to ASTM A-53 Grade B.
- .2 NPS 2 and Smaller Pipe Joints:
 - .1 Schedule 40: Screwed, Victaulic Roll Grooved Couplings or Victaulic F.I.T.
 - .2 Schedule 10: Victaulic Roll Grooved Couplings or Victaulic F.I.T.

- .3 Schedule 5: Victaulic Pressfit System.
- .3 NPS 2½ up to NPS 8 Pipe Joints:
 - .1 Schedule 40: Welded, Flanged, Victaulic Roll Grooved Couplings.
 - .2 Schedule 10: Victaulic Roll Grooved Couplings
- .4 NPS 8 and Larger Pipe Joints:
 - .1 Schedule 30/40: Welded, Flanged, Victaulic Roll Grooved Couplings
 - .2 Schedule 10, Victaulic Roll Grooved Couplings
- .5 Where rolled grooved couplings and fittings are used they shall be of the same manufacturer.
- .6 Copper Tube: Type L hard drawn.
 - .1 Solder, Tin-antimony 95:5.
- .6 **Hangers and Supports**
 - .1 No drilling or welding of any structural steel members shall be permitted.
 - .2 Cadmium plated threaded rod-nuts and washer. All hanger rod installations to be double nutted (top and bottom).
- .7 **Valves**
 - .1 Ball valve for pipe up to NPS 2.
- .8 **Balancing Valves**
 - .1 Provide flow measuring fittings and balancing valves on each heating unit and each coil bank.
- .9 **Air Vents**
 - .1 Provide a mini ball valve on pipe between main and air vent for shut-off and servicing of vent.
- .10 **Thermometers**
 - .1 As required for system monitoring.
 - .2 Locate thermometers to facilitate reading.
 - .3 Provide at inlet and outlet of all main heat exchange equipment, including boilers, heat exchangers and chillers.
 - .4 Provide at supply and return piping from main heating and cooling zones.
- .11 **Pressure Gauges**
 - .1 As required for system monitoring.
 - .2 Provide at inlet and discharge of each circulator and/or pump over 1/2 hp.
 - .3 Complete with mini ball valves with snubbers.
- .12 **Air Separator**
 - .1 Locate air separation equipment at the pump suction.

.13 Relief Valves

- .1 On each hydronic system.

.14 Strainers:

- .1 On each hydronic loop. Incorporate into air separators or suction diffusers.

.15 Hydronic Heating Units

.1 Wall Fin Radiation:

- .1 Aluminium fin on seamless copper tube,
- .2 Minimum 16 gauge prime painted steel enclosure with hanger, brackets, etc.
- .3 Slip joint construction
- .4 Access doors with cam locks to all valves, vents, etc.
- .5 Element supported on roller bearing or Teflon cradle.
- .6 Where element lengths are less than 50% of the enclosure length, the element shall be broken into two (2) sections spaced equally in enclosure.

.2 Linear Radiant Ceiling Panels:

- .1 Copper tubing mechanically fastened to aluminium face
- .2 Support Linear Panels with two hanger wires per cross brace

.3 Modular Radiant Ceiling Panels:

.4 Panel Radiator:

- .1 Constructed of prefinish cold rolled low carbon steel, fully welded and consisting of header pipes at each end.
- .2 Working pressure: medium - 85 psi max. (tested at 110 psi).

.5 Cabinet Heaters:

- .1 3 speed switch and manual starter accessible through an access door in the front cover.

.6 Unit Heaters.

.7 In Floor Radiant Heat.

.16 Pumps

- .1 Centrifugal type with quiet operating characteristics and maximum speed of 1750 rpm.

- .2 Pump motors must be non-overloading over published rating curve

.3 In-Line Circulators.

.4 Vertical In-Line Pumps.

.5 Base Mounted Pumps:

- .1 Provide flexible joints in piping at base mounted pumps.

- .2 Upon satisfactory pump alignment, grout base.

.6 Suction Guides

- .17 **Heat Exchanger**
.1 Plate Heat Exchangers or Shell-in-Tube Heat Exchanger.
- .18 **Pre-Charged Expansion Tanks**
.1 Give preference to diaphragm tank.
.2 Locate at or near the pump suction.
- .19 **Automatic Water Feeder**
.1 Complete with reduced pressure type back flow preventor.
.2 Domestic water shall not be directly connected to piping systems containing glycol.
- .20 **Chemical Treatment**
.1 Hydronic Systems to be chemically treated.
.2 Provide propylene glycol, pre-mixed solution complete with inhibitors for the glycol heating system.
- .21 **Cooling Equipment**
.1 For cooling load of over 500 tons the down time justifies splitting the load into two machines.
.2 Under 500 ton load a multiple installation should be justified by an analysis of capital investment, operating cost, energy conservation and the cost of down time loss.

6.7 AIR DISTRIBUTION

- .1 **General**
.1 All supply, return and exhaust grilles to be ducted with galvanized duct.
No return air plenums.
.2 Avoid recirculation of exhaust air with outside air by properly locating intakes and outlets with relationship to wind pressure and direction.
Ensure that air intakes are not adversely affected by hot roof surfaces or by foul and hazardous exhaust discharges.
.3 Do not locate apparatus adjacent to conference rooms, sleeping quarters, broadcasting, or similar audio facilities.
.4 Use outdoor air-as free cooling source.
.5 The air distribution system may be used for smoke control providing it meets Fire Marshal approval.
.6 No Stairwell, ramp, or other portion of the exit facilities of the building involved in the vertical portion of the exit pattern, or in a protected hallway leading from the discharge point of a vertical exit to the outside of the building, shall be used for the distribution of return air.

- .7 Air shall not be recirculated from any space in which there are flammable vapours, flyings, or dust.
- .8 Outside air intakes shall be located to avoid the drawing in of combustive material and to minimize the hazard from fires in other structures.

.2 Ventilation Systems

- .1 Where practical, design air distribution systems to first use air that would normally be exhausted by building return systems. If this is inadequate, increase the outside air for the air distribution systems and then if required provide separate tempered make-up air system.
- .2 System should prevent area cross contamination by ensuring air flow from less to more contaminated areas.

.3 Exhaust Systems

- .1 Spaces which house sources of contaminants shall be mechanically ventilated.
- .2 Whenever a stack, duct, shaft, or other enclosed ventilation means are used, adequate access shall be provided so the entire system has a proper access opening every 20 feet.
- .3 Any system used to prevent the hazardous accumulation of vapours, dust, fumes, greased, etc., shall not be interconnected or form part of any other ventilation, air conditioning, or exhaust system.

.4 Ductwork

- .1 Galvanized steel in accordance with SMACNA.
- .2 No fibrous duct liner exposed to air flow.

.5 Duct Sealers and Tapes

- .1 Seal all ductwork.
- .2 In accordance with SMACNA duct classification.

.6 Flexible Ductwork

- .1 At branch takeoffs to diffusers, provide insulated flexible acoustic duct for a maximum distance of 10'-0".
- .2 Support flexible duct at 5'-0" intervals.
- .3 Maximum 15° offset with flexible duct. Use sheet metal elbows for bends.

.7 Relief Dampers

- .1 Avoid use of unregulated relief dampers.
- .2 Where unregulated relief damper must be used, apply heavy duty type which will not flutter or chatter under normal wind velocity of fan discharge conditions.

.8 Access Doors

- .1 Access doors to be installed at all fire dampers, control dampers, outside air and exhaust air plenums, all devices requiring maintenance, coils, bottom of risers.
- .2 Provide access doors in all ducts at no more than 40 ft. apart.

.9 Flexible Connections

- .1 Installed on the inlet and outlet connections of each fan and Air Handling Units not internally isolated.

.10 Dampers

- .1 All exhaust air systems, including roof and wall exhaust fans, shall be complete with motorized backdraft dampers.

.11 Fire Dampers

- .1 At fire rated separations.
- .2 Install as per manufacturer's recommendation.

.12 Air Handling Units

- .1 Packaged air handling units to be designed in accordance with ASHRAE Standard 62-89 "Ventilation for Acceptable Indoor Air Quality".

.13 Filters

- .1 Locate filters for straight-through unrestricted air flow to eliminate turbulence, dead air spaces and eddy current.
- .2 Pre-filter shall be replaceable media in steel frames.
- .3 Minimum final filter efficiency of 60% dust spot.

.14 Hot Water Coils

- .1 Prevent coils from freezing during both system shut-down and normal operation, e.g. use high efficiency mixing boxes and outside air dampers with negligible leakage and keep water circulating.
- .2 A three way valve and separate pump system with constant flow and varying coil supply water temperature is recommended.
- .3 For sub-freezing operating conditions and where the systems must operate continuously, use a propylene glycol water solution with inhibitors.

.15 Energy Recovery Units

- .1 Rotary air-to-air heat exchangers
 - .1 Have latent and sensible efficiency. The transfer media shall be non-asbestos. The rotor shall be constructed of corrugated aluminium treated with desiccant coating and strengthened with

- .2 radial spokes for rigidity. The desiccant coating shall be bacteriostatic, non-toxic and non-corrosive.
 - .2 Built-in purge section allowing a maximum cross contamination of particulate to .01% by volume of exhaust air.
 - .3 Powered by an adjustable frequency fractional horsepower AC motor. Variation of motor speed to be accomplished via an Adjustable Frequency A/C Motor Drives.
 - .2 **Run Around Coil System:**
 - .1 A run around loop is a built-up system rather than a manufactured item and is specified in the appropriate sections.
 - .2 Run around loop must be charged with a propylene glycol solution.
 - .3 **Heat pipe:**
 - .1 With capacity control.
- .16 Welding and Paint Spray Booths**
- .1 Adequate exhaust velocities across the open frontal areas must be maintained and fire hazard considered. Tempered makeup air must be provided.
- .17 Kitchen Hood, Exhaust Fan and Make-up Air Systems**
- .1 Hoods and fans to be ULC listed and labelled.
 - .2 Fans to be complete with backdraft damper.
 - .3 Entire hood and fan system to be installed to NFPA 96 requirements.
 - .4 Kitchen make-up air system may use indirect gas firing when interlocked with mechanical exhaust system.
- .18 Fume Hoods for Laboratory**
- .1 Sash control varying exhaust through hood by by-passing air.
- .19 In-Line Fans**
- .1 All units shall be provided with suitably sized spring type vibration isolators.
 - .2 Fans shall be mounted in such a manner so that maximum space is available for access to all parts requiring periodic maintenance while maintaining adequate headroom.
- .20 Exterior Louvers**
- .1 Apply louvers that minimize entry of snow and water into the equipment.
 - .2 Locate air louvers minimum 30" above roof. Consider local snow fall and drifting conditions.
 - .3 All fasteners to be stainless steel or aluminium.
 - .4 Provide bird screen secured in a removable extruded aluminium frame.

.21 Grilles, Registers and Diffusers

- .1 Supply air shall be introduced through ceiling mounted supply diffusers size and quantity as required to effectively deliver the air to the occupied zone.
- .2 Return and exhaust shall be removed through ceiling mounted registers.
- .3 Locate balancing damper at branch duct take off not grilles, registers or diffusers.

6.8 CONTROL SYSTEMS

.1 General

- .1 Arranged to avoid simultaneous heating and cooling.
- .2 Provide for operating schedules, set back, free cooling cycles and unoccupied shut down.
- .3 Control equipment shall be the product of one manufacturer unless otherwise specified.
- .4 Controls to be pneumatic actuation with direct digital control logic, Direct Digital Control (DDC) or total Direct Digital Control (DDC).

.2 Space Control:

- .1 Spaces subject to different loads must have separate control systems.
- .2 Zones with separate heating and cooling units must have the units sequentially controlled from a single sensor.

.3 Air System Control

- .1 When unit is shut off, maintain mixed air temperature at 60° F (15.5° C) to prevent over heating.
- .2 Humidity Control:
 - .1 Only one feedback variable shall control all humidifiers of any one system.
 - .2 On humidifying demand, the control shall modulate the humidifier.
 - .3 All humidifiers shut off when the fan stops.

.4 Low Limit Controllers

- .1 Outside air dampers must close when supply fan stops. Dampers are to be of the low leakage type.
- .2 Controllers shall have minimum 1 foot per square foot of coil or 20'-0" whichever is greater. Continuous elements with control at the coolest point. Reset shall be manual.

.5 Control Air Supply

- .1 Provide two electric driven oil lubricated air compressors mounted on a single ASME rated tank. Select each compressor for 2/3 of the control air load based on 33% running time.
 - .2 Refrigerant after cooler.
- .6 **Actuators**
- .1 Provide spring returns so that the dampers "fail-safe" is normally open or closed position as dictated by freeze, fire or over-temperature protection.
- .7 **Control Panels**
- .1 Panels shall have hinged key lock door for full access.
 - .2 All controllers, thermometers, or temperature indicators, relay, switches, etc. shall be panel mounted. The panel shall be steel with hinged door. The temperature indicators (or thermometers) and switches shall be surface mounted on the door and tagged with lamecoid labels.
- .8 **Provisions For Central Monitoring**
- .1 All Control Systems should be designed to accommodate the addition of central monitoring Direct Digital Control (DDC) systems.
 - .2 All controllers shall be capable of being reset from a remote point.
 - .3 All high limit and low limit alarms to be provided with DPDT contacts or auxiliary relays to allow for central DDC indication of alarm conditions.
 - .4 Additional temperature sensing wells, pressure taps and flow measuring sensors to be provided to allow for the addition of DDC sensors.
- .9 **Direct Digital Control (DDC)**
- .1 An information sharing network of Stand Alone Direct Digital Control Panels (DDCP's) to monitor and control equipment.
 - .2 Communications Processing:
 - .1 Operate as a true token-pass peer-to-peer communications network between panels.
 - .2 The failure of any DDCP on the network shall not affect the operation of other DDCP's. A DDCP failure shall be annunciated at the specified alarm printers or terminals.
 - .3 Historical trend data shall be collected and stored at each DDCP for later retrieval. Retrieval may be manual or automatic. Any point, physical or calculated, may be designated for trending. The system shall allow for two methods of trend collection: either by a pre-defined time interval sample or upon a pre-defined change of value.
 - .4 Telecommunications Capabilities:
 - .1 Furnish a telecommunications interface as necessary to allow direct connection of DDCP's and networks to public and private phone lines. This device shall be capable of both automatic answer and

automatic dial methods of call handling. The unit shall be able to store a minimum five (5) phone numbers of at least 20 digits.

- .2 Automatic answer capabilities to allow it to be accessed from a remote central computer or terminal with modem. The interface unit shall be able to allow the person calling access to any information on the network, provided that the standard log-on security screening is met.

.10 System Status

- .1 All fan status to be by pressure differential switches or by analog type current sensors.
.2 All pump status to be by analog type current sensors.

6.9. BALANCING

- .1 All balancing shall be done to AABC Standards.
.2 Air Distribution Systems:
.1 Test and balance all air supply, return, and exhaust systems.
.3 Water Circulating Systems:
.1 Balance water flow through all equipment including heating coils, cooling coils, chillers, etc.

7.0 ELECTRICAL OUTLINE



ELECTRICAL DESIGN REQUIREMENTS

7.1 Intent:

- .1 This Electrical Outline is for schools, designed, constructed and operated by the private Sector.

7.2 Design Basis

- .1 Base the electrical design on providing the following features at the most economical cost, considering both investment and operating expenditures:
 - .1 Safety to personnel during operation and maintenance.
 - .2 Performance of electrical systems.
 - .3 Compatibility with other design elements.
 - .4 Ease of maintenance of equipment maintained by non-specialized personnel.
 - .5 Flexibility of electrical services.
 - .6 Proper co-ordination of all elements of the system as to:
 - .1 Insulation Levels
 - .2 Interrupting Capacities
 - .3 Overcurrent protection.
 - .4 Mechanical Strength
 - .5 Hazardous Location Classification
 - .6 Allowance for future growth and expansion.
 - .7 Compliance with all governing standards and codes.
- .2 In no instance shall the Standard established by this Electrical Outline Document be reduced by the application of any other code.

7.3 Incoming Electrical Services

- .1 Generally, underground service is preferred and used where required to conform to local practice. Ensure that overhead utility lines do not cross over the play fields or buildings. Cable and installation should be to the approval of the local Power and Inspection Authorities. Provide spare ducts for future additions or maintenance.
- .2 Obtain from the power authority the three phase symmetrical short circuit fault level at the incoming end of their service to determine the interrupting capacity required for the service equipment.
- .3 The use of exterior pad mounted transformer is preferred provided there are no objections from NSPI.

7.4 Capacity of Electrical Service

- .1 Allow for 100% lighting load plus an appropriate demand factor on the remaining load, based on operating characteristics.

- .2 The main service should provide for minimum 25% load growth plus an allowance for future expansion if anticipated.

7.5 Electrical Rooms

- .1 Maintain the clearances about the equipment as required by CSA C22.1-98, Canadian Electrical Code, Part 1 Safety Standard for Electrical Installations (C.E.C.), or as specified, whichever is greater.
- .2 Allow for future expansion and for the need to move electrical equipment (transformers, etc.) in and out for repairs, replacement, etc.
- .3 Provide ventilation.
- .4 No plumbing lines are to run in the walls and ceiling of electrical rooms.
- .5 The electrical equipment room shall be located on the ground floor where feasible.
- .6 Provide concrete housekeeping pads for all switchboards, motor control centres, transformers and all other free-standing pieces of electrical equipment.
- .7 Electrical rooms are not to be located under washrooms, lockers, shower rooms, janitor's closets, kitchen, etc. or any such areas where flooding could occur.

7.6 Switchgear Assemblies

- .1 Use metal-enclosed assemblies with moulded case circuit breakers where current, voltage and short circuit characteristics are within their limits.
- .2 Provide secondary distribution protection and co-ordination study.
- .3 Main switchboards rated at 400 amps and larger are to be free-standing, 24" in depth, complete with minimum working space of not less than 48 inches between any portion of board and walls.
- .4 Main busbars are to be fabricated of copper or aluminium.

7.7 Transformer Types

- .1 Winding configuration: Open delta (two coil) configuration for three phase transformers is not acceptable.
- .2 Transformer windings are to be of copper.
- .3 All transformers are to have vibration isolators.
- .4 Ensure transformers serving computer equipment are K rated as required.

7.8 Panelboards

- .1 Use circuit breaker type panelboards for motors, power equipment and lighting.
- .2 Circuit breakers to be of the bolt-on type. Multipole breakers to have single handle. Tie-bars not permitted.
- .3 Switch and fuse units may be used for high short circuit protection.
- .4 Mains or bussing to be made of copper or aluminium.
- .5 Each circuit shall be clearly labelled on a typewritten directory with a clear

plastic cover.

- .6 Branch circuit panelboards to be fitted with lock type doors.
- .7 Provide factory installed bonding terminal strip in all panelboards.
- .8 Branch circuit panelboards are to be complete with minimum of 10% spare 15 amp 1 pole breakers, 10% spare spaces, and locking devices for 10% of panel circuit breakers.
- .9 Panelboards shall be centrally located within the servicing area to minimize the length of branch circuit wiring runs.
- .10 Branch circuit panelboards up to 225 amp. mains shall be a minimum of 20" wide by 5.75" deep.
- .11 Panelboards serving computer equipment shall be supplied with integrated TVSS. These panelboards shall serve only computer equipment.
- .12 Distribution Panelboards (CDP type) of 400 amp. mains and above shall be a minimum of 38" wide by 11" deep. Provide a minimum of 2 - 3 pole spare circuit breakers.

7.9 Motor Controls

- .1 Co-ordinate control sequences to provide starters, and other auxiliary control equipment with the proper characteristics and features to obtain the performance intended.
- .2 Provide disconnect switches, starters and auxiliary control equipment which are not an integral part of packaged units described in equipment specifications but which are required for performance and sequence of operation of equipment.
- .3 Motors one HP and over are to be three-phase, where three phase power is available.
- .4 When a manual-automatic operation is required use a "Manual-off-Automatic" selector switch. Connect the selector switch so that only the normal automatic regulating control devices will be bypassed when the switch is in manual position. Connect safety control devices, such as low or high pressure cutouts, high temperature cutouts, motor overload, etc., in the control circuit in both the Manual and Automatic positions of the selector switch.
- .5 For three-phase motor starters provide:
 - .1 Magnetically operated motor starter.
 - .2 Fused control transformer for all 110 volt control.
 - .3 Manual/off/automatic selector switch where remote control of all three functions are required. Three position hand/off/auto selector switches not be used to operate controls requiring only on/off, two position function.
 - .4 Provide solid state single phasing protection for motor sizes 5 HP or larger.
 - .5 LED type pilot lights.
 - .6 Overload protection on all three phases.
 - .7 Use motor control centres where they provide an economical and

practical grouping of controls. Centres should be free-standing structures. Use combination starters. Mount centres on continuous mounting channels on raised concrete pads. Wall mount type may be used for groups of up to four starters. Identify each circuit by a black laminated plastic nameplate with white letters. Specify control centres as per CEMA Standard for class and type.

7.10 Drip Hoods

- .1 Electrical equipment with ventilation openings i.e.; switchboards, dry type transformers., etc., where installed in rooms containing sprinkler heads are to have openings protected with noncombustible type hoods or shields. Refer to C.E.C. Rule 26-008.

7.11 Identification

- .1 All electrical equipment shall be identified by the use of lamicoid plates.
- .2 All electrical junction, pull boxes, splitters and outlet boxes shall be colour coded with appropriate colored paint.
- .3 All junction boxes shall have the panel and circuit numbers contained with-in, identified by writing on the cover plate using a black indelible marker.
- .4 All wiring shall be identified through the use of self laminating labels.
- .5 All receptacles shall be identified through the use of lamicoid plates.
- .6 All internal broadcasting connection points shall be identified through the use of lamicoid plates.
- .7 All communication outlets (i.e. LAN, television system, telephone, etc.) shall be identified through the use of lamicoid plates.
- .8 - Identification to be in English.

.9 System Nameplates

- .1 Lamicoid 1/8 inch thick plastic engraving sheet, black face, white core, for all electrical systems. Fire alarm systems to have red with white core lamicoid plates.

.2 NAMEPLATE SIZES

| | | | |
|--------|--------------|---------|-------------------|
| Size 1 | 3/8" x 2" | 1 line | 1/8" high letters |
| Size 2 | 1/2" x 3" | 1 line | 1/2" high letters |
| Size 3 | 1/2" x 3" | 2 lines | 1/8" high letters |
| Size 4 | 3/4" x 3.5 " | 1 line | 1/4" high letters |
| Size 5 | 3/4" x 3.5" | 2 lines | 1/2" high letters |
| Size 6 | 1" x 4" | 1 line | 1/2" high letters |
| Size 7 | 1" x 4" | 2 lines | 1/4" high letters |

.10 Colour Coding of Electrical Boxes

- .1 The colour coding of splitters, junction boxes, pull boxes and outlet boxes will follow the schedule as listed:

| <u>System</u> | <u>Primary Colour</u> | <u>Secondary Colour</u> |
|-----------------------|-----------------------|-------------------------|
| 51 volts to 240 volts | YELLOW | - |
| Above 240 volts | ORANGE | - |
| Fire alarm | RED | - |
| Telephone | BLACK | - |
| Public Address | BLUE | - |
| Ground | GREEN | - |
| Security | BROWN | - |
| Mech. Controls | WHITE | RED |
| Television | YELLOW | WHITE |
| LAN | BLACK | WHITE |

- .2 All various systems junction and/or pull boxes etc., where located above ceiling grid system, shall have location identified on underside or room side of t-bar spline, with (3/4") or (1/4" on 3/4") self adhering colour coded circular shaped discs, affixed directly to spline in close proximity to where concealed box is located. The same type of discs to be installed on ceiling or wall access cover plates.
- 1/4" discs are all white in colour.
 - 3/4" discs are colored as indicated.
 - 1/4" to be affixed to center or middle of 3/4" discs as system colors indicates.

.11 Wiring Identification Labels:

- .1 Write on self laminating labels.
- .2 Panduit No's PLD-1, PLD-2.

.12 Equipment Lamicoid Identification

- .1 Applied to all electrical equipment including equipment enclosures for starters, disconnect switches, relays, panelboards, splitter troughs, transformers, thermal overload switches.

.2 Fastening method as follows:

- .1 Concrete or concrete block: Use 2 screws, 1/2", #6 panhead.
- .2 Plasterboard: Contact type cement (Note: Peel off type not acceptable).
- .3 Equipment enclosures: Pop rivets or self tapping screws.

.3 Identify equipment as follows:

- .1 Electrical equipment enclosures for starters, (other than MCC) disconnect switches, relays etc.:
 - .1 Voltage and phase.
 - .2 Power source feed i.e.: "Fed from Panel "A", cct 1,3,5".
 - .3 Equipment being fed i.e. "Supply fan #3".
 - .4 Equipment number (Refer to 871, 872).
 - .5 Size 7.

- .4 Fused disconnect switch and combination starter enclosures: (Other than MCC).
 - .1 Voltage and Phase.
 - .2 Power source feed (as above).
 - .3 Equipment being fed (as above).
 - .4 Maximum fuse size installed.
 - .5 Size 7.
- .5 Panelboards, splitter troughs.
 - .1 Designated assigned letter.
 - .2 Voltage, phase, wires.
 - .3 Over current protection on feeder.
 - .4 Where feed originates.
 - .5 Example: "Panel L", 120/208V, 3 phase, 4 wire, 100 amp fed from RM 121".
 - .6 Size 7.
- .6 Main service entrance switchboard.
 - .1 Main overcurrent device.
 - .1 Voltage and phase.
 - .2 Rated ampacity.
 - .3 Size 7.
 - .2 Feeder overcurrent devices.
 - .1 Equipment being fed and its location.
 - .2 Current rating.
 - .3 Size 3.
 - .3 Transformers:
 - .1 Designated assigned number.
 - .2 All relevant voltages and KVA rating.
 - .3 Installed overcurrent device.
 - .4 Fed from.
 - .5 Feeding.
 - .6 Example: TX-1, 600/120/208V, 30. 150 KVA, 200 AMP, Feed from RM 121, Feeding Panel "L", RM 107.
 - .7 Size 7.
- .7 CDP panelboards.
 - .1 Label each breaker with a separate lamicoid identification plate, size 7.
- .8 Thermal overload switches.
 - .1 Indicate system controlled.
 - .2 Indicate voltage.
 - .3 Size 2.
- .9 Motor Control Center Enclosure.
 - .1 Voltage, phase, # of wires.

- .2 FED from.
- .3 Overcurrent Protection.
- .4 Size 7.
- .10 Individual Motor Starter Units within MCC's.
 - .1 Starter size.
 - .2 Equipment number fed.
 - .3 Equipment description (i.e., supply fan #5).
 - .4 Equipment horsepower (from motor nameplate).
 - .5 Size 7.
- .11 Receptacles:
 - .1 Indicate panel & cct number.
 - .2 Example: "Panel SS1-33".
 - .3 Size 1.
- .12 Internal Broadcast Connection points.
 - .1 Size 1.
- .13 Communication Outlets.
 - .1 Size 1.
- .13 Identification of electrical junction boxes, pull boxes, splitter troughs, outlet boxes:
 - .1 Apply colour coding prior to pulling conductors into boxes.
 - .2 Where primary colour only is indicated:
 - .1 Colour inside and outside of box.
 - .2 Colour all cover plates.
 - .3 Where primary and secondary colors are indicated:
 - .1 Paint inside and outside of box with the primary colour.
 - .2 Diagonally apply to each half of the cover plate the primary and secondary colors.
 - .4 Provide a legend of colour coding used under plexiglass. Locate in main electrical room.
- .14 Identify wiring with permanent indelible identifying markings, either numbered or colored plastic tapes, on both ends of phase conductors of feeders and branch circuit wiring.
- .15 Labeling of all branch circuit wiring including phase conductors, neutral, ground and/or bonding conductors to be done on both ends of all circuit wires plus in any junction and/or pull boxes located in between. Use write-on self laminating labels. Wrap around conductor in a "U" fashion.
- .16 Indicate panel and circuit number i.e.: Panel 'A', cct. #10.
- .17 Identify on the coverplate of all junction boxes, using permanent indelible black marker, the panel and circuit numbers contained within.

7.12 Building Wire

- .1 Current carrying and bonding conductors: minimum wire size shall be #12 AWG, stranded, soft drawn copper.

- .2 Current carrying and neutral conductors shall have RW90 XLPE insulation rated for a minimum of 600 VAC.
- .3 Grounding and bonding conductors up to and including #3/0 AWG to have green colored RW90 X-link insulation, #8 AWG and larger to have green colored TW 75 insulation.
- .4 Unless noted otherwise, phase colour coding as per C.E.C. rule 4-036, subrule (2) will apply.
- .5 All phase conductors sized from #12 AWG up to and including #1 AWG to have appropriate colored insulation (red, black & blue).
- .6 All neutral, grounds and/or bond conductors sized #12 AWG up to and including #3/0 AWG to have appropriate colored insulation (white or green).
- .7 Colored tape may only be utilized when phase conductors sized larger than noted in item 5 are used.
- .8 The voltage drop in no instance shall exceed 3% of the line voltage. The following table is intended for all 120 volt, 15 amp. branch circuits and is to include both vertical and horizontal lengths of conductor runs. Minimum size of branch circuit neutral where phase sharing occurs, shall not be smaller than #10 AWG. Minimum size of branch circuit neutral where dedicated to its own branch circuit phase conductor shall not be less than #12 AWG. Note that minimum size #10 AWG bond conductors to accompany #8 branch circuit conductors.

| Branch Circuit Length of Run | Phase Wire Size | Dedicated Neutral | Shared Neutral | Bond Wire Size |
|------------------------------|-----------------|-------------------|----------------|----------------|
| 1' to 80' | #12 | #12 | #10 | #12 |
| 81' to 125' | #10 | #10 | #8 | #12 |
| 126' to 185' | #8 - | #8 | #6 | #10 |

- .9 Oversized #10 AWG branch circuit wiring conductors to be extended to outlet box of device they feed. Oversized #8 AWG branch circuit wiring conductors to be extended from panelboard to junction box located on wall or ceiling directly above receptacles. #8 AWG wire to be reduced to #10 AWG for vertical portion of drop only.

7.13 Wiring Methods

- .1 Unless noted otherwise, all feeder circuit conductors are to be installed in EMT, with a separate green minimum sized #12 AWG ground conductor in each conduit run. Minimum size #12 AWG, green insulated bonding conductor to be installed in all conduits containing branch circuit wiring, and in all conduits containing various systems wiring.
- .2 Liquid seal flexible conduit, shall be used for connections to all motors and vibrating equipment.
- .3 EMT shall be installed as a complete system and shall be securely fastened in

- place within three feet of each outlet box, junction box, cabinet, couplings or fittings and the spacing between supports shall be as per the C.E.C.
- .4 Unless noted otherwise, steel set screw type fittings shall be used on EMT and flexible conduits. Rigid conduit bodies made of alloys or malleable types of metals not to be used. Threaded plastic or metal bushings to be installed on all EMT connectors sized 1 $\frac{1}{4}$ " and larger. Nylon insulated throats are not required on EMT connectors.
- .5 AC-90 cable may be used:
- .1 As branch circuit wiring for general light and power circuitry where installed concealed in walls and ceilings.
 - .2 As individual cable drops from junction boxes to fixtures provided they are no longer than 15 feet, do not run from room to room and are adequately supported.
 - .3 The wiring of outlets or devices in cabinetry where it is impractical to install conduit.
- .6 All AC-90 cable shall be run parallel to building lines and shall be adequately clamped and "ty-wrapped" to the building structure every 60" or fraction thereof, in such a manner that they are protected from mechanical damage. Install supports for cabling in ceiling spaces, and do not use those of other trades or secure cabling to pipes, ducts, suspended ceiling support wires, etc. The laying of cables directly atop ceiling grids is strictly prohibited.
- .7 Install and secure cables directly to underside of metal decking when and where possible whenever cables are running parallel to the steel joists. When the cables are perpendicular to the steel joints, the cables are to be installed and secured to the metal flutes of the decking. Cables are to be installed as high as practical to the structure. Where the restricted use of "ty-wraps" are permitted, then "ty-wraps" are to be secured directly to the structure with screws, nails, rivets, etc. The use of self-adhering base plates is not acceptable.
- .8 The grouping together of cables to form a "bundle" for securing purposes is acceptable provided:
- .1 In addition to securing single cables at 60" intervals, the installation of multiple or bundled cables shall be secured with additional support at the mid-point (i.e. 30") between the main supports.
 - .2 The minimum size conductors to be used for the wiring AC branch circuits of voltages rated 120 volts and larger shall be #12 AWG.
 - .3 Grouping of cables shall be limited to a maximum of eight (8) current carrying conductors (including neutrals). Examples:
 - Maximum of two runs of #12 /4C cables.
 - Maximum of two runs of #12/3C cables and one run of #12/2C cables.
- .9 The incoming (Panel Side) grounding conductor shall be secured to the grounding screw of each outlet box, before connecting to the other grounding conductors. Twist all grounding conductors to the back of the outlet box, such that the

- grounding conductors obstruct as little room as possible.
- .10 All flexible conduit or AC-90 fixture feeds shall originate from the side of the outlet box and not from the box cover. Where 3 or 4 drops extend from one outlet box, the box shall be a minimum 4-11/16 " square. There shall be no more than 4 drops from any one box. All flex or AC-90 cables used for fixture drops are to be secured within one foot of the junction box. Each fixture is to be complete with its own separate fixture drop originating from a junction box within that room. No. 14 AWG cable can be used where the fixture drop load does not exceed 1000 watts. Where the load exceeds 1000 watts, then #12 AWG fixture drops are to be used. When there are two or more fixture drops in on junction box, then "pig-tail" leads are to be provided on both the returns and the neutral connections.
- .11 The exposed, surface installation of AC-90 cable branch circuit home runs in electrical rooms is acceptable provided the cables are neatly and properly "marshalled" as they enter/leave their respective panels. This mar shalling of cables is to be achieved using galvanized, steel, ladder type, cable tray, minimum 18 " wide, extending up and out into the nearest accessible ceiling space.
- .12 The requirements for larger conductors to accommodate the shared neutral and bonding policy (refer to Building Wire Section) may restrict the use of AC-90 in certain applications, due to increased gauge for neutral and bond conductors. However AC-90 with the proper conductor gauges may be used, if available.
- .13 Support of electrical systems raceway shall be independent of any type of suspended ceiling support rods wires, etc. and mechanical piping or duct systems. All suspended types of junction, pull and outlet boxes to be with "minimum" size 3/8" threaded rod, nuts and flat washers. Threaded rods to be secured to boxes with one flat washer and nut installed on both sides of box. One rod required for all boxes sized up to and including 4 11/16" square. Two rods required for boxes larger than 4-11/16" square, up to and including 8" x 8" square. A minimum of not less than four rods required for all boxes larger than 8" x 8" square. Concealed junction, pull, outlet, etc., type boxes located in ceiling spaces are not to be greater than 30" above finish ceiling elevation.
- .14 In no case shall a pull or junction box be installed in a ceiling space that is not considered accessible.
- .15 All junction and or pull boxes 6" x 6" in size or larger where surface installed shall be either type "C" or "E", complete with hinged coverplate.
- .16 All type "D" junction and/or pull boxes where flush mounted, are to have the finish cover plate sized a minimum of 1" larger than the box.
- .17 All concealed type junction and/or pull boxes larger than 4 11/16" square boxes shall be type "C" or "E", complete with hinged coverplates.
- .18 Sectional boxes are not to be used with PVC, rigid/thin wall conduit installation. Sectional boxes are intended for flexible conduit, AC-90, and/or other types of "pliable" cables.
- .19 Surface type device outlet boxes install below 8' AFF, shall be cast type "FS" or

- "FD" services as required complete with matching "FS" metal type plates unless noted otherwise.
- .20 Where cables (for television, P/A, telephone, LAN, etc) are permitted to be installed in a ceiling space without the use of conduit, main runs shall be installed in a steel, ladder type cable trough. Where cables are fanned out from cable trough, cables shall be run parallel to building lines and secured within 12" of termination and at intervals not exceeding 48". Cable shall be secured to structures with the use of Ty-Rap cable straps and bases. Cables shall be run parallel to building lines as near as possible to overhead concrete ceiling slab or metal decking and secured to their surfaces as follows:
- .1 To concrete, masonry or brick with Thomas & Betts mounting base #TC 5358 or #TC5359 complete with accompanying ty-wraps.
 - .2 To sides of metal decking with Thomas & Betts "Drive-ty" #TY54MX complete with self tapping, #10 sheet metal screw.
 - .3 Pliable type cables to be secured at 4 foot intervals and at each point where direction changes take place.
 - .4 Cables to have insulation qualities as indicated.
 - .5 Vertically installed conduit stubs to be provided in all walls complete with flush installed device boxes.
 - .6 Stubs to be turned out with 90° elbow into ceiling space of room containing device box as near as possible to concrete slab or metal decking, and have steel EMT connector complete with plastic bushing installed on same.
 - .7 Where cable troughs incorporating various systems' low voltage wiring have been installed, all conduit wall stubs shall be extended to within 12" of trough.
- .21 Fire barrier material is to be used when penetration is made through a fire rated wall, floor or ceiling. The standard of acceptance is 3M (putty 303 and fire barrier wrap/strip FS195 and composite sheet CS 195) or ULC approved equal. These materials are to be used strictly according to manufacturer's instructions.

7.14 Receptacles

- .1 Provide receptacles in each corridor on a dedicated circuit.
- .2 In addition to general power requirements in gymnasium, a 100 amp 120/208V 3Ø, 4W branch circuit panel reserved exclusively for supplying power to equipment for bands, etc. shall be installed on the stage. This panel shall be surface mounted and complete with 6-15 A-1P, 2-20A-1P, 2-30A-1P and 1-50A-2P circuit breakers. Provide 2-15A, 1-20A and 1-30A, 120V receptacles mounted below the panel at 18" AFF.
- .3 Provide dedicated circuits, and dedicated neutral conductors to receptacles for computer equipment.
- .4 All vertically installed 120V/15 amp U-ground receptacles to be installed with

grounding opening oriented to upper or top position.

- .5 All horizontally installed 120V/15 amp U-ground receptacles to be installed with neutral or long axis opening on upper or top side.
- .6 Pig-tail type leads to be installed in all device or outlet boxes feeding receptacles, alarms, etc. "Daisy-chain" or looping through of conductors from one device to another is not permitted. Provide separate leads for final connections to same.
- .7 All receptacles in washrooms are to be fed from ground fault circuit interruptors.

7.15 **Grounding**

- .1 All grounding and bonding shall be in accordance with the applicable codes and standards, as referenced herein.
- .2 Install minimum size 1/4" x 3" x 24" copper grounding bus bar on wall, complete with wall insulating supports in main electrical room unless specifically sized otherwise, for all services 200 amps and larger.
- .3 The main incoming ground conductor is to run to the ground lug in the main electrical switchboard and then run unbroken to the wall mounted ground bus.
- .4 All electrical connections to take place on ground bus bars with "compression" type lugs, suitable for terminating both copper and/or aluminium conductors.
 - .1 Copper two hole, long barrel type lugs for all sizes #4 AWG and larger.
 - .2 To be bolted to bus bar via tapped threaded hole complete with accompanying flat and lock washers.
 - .3 Use "Burndy" type "ground to bus" connectors series "GB" or "GC" or approved equals, where "feedthrough" type terminations to bus bars are required for either single or parallel connections.
- .5 The ground conductor pulled in with the primary conductors feeding a transformer shall be sized to meet the requirements of the secondary ground conductor which is to be sized a per C.E.C. table No. 17

7.16 **Lighting**

- .1 For each room or area determine the task performed and provide maintained uniform lighting levels recommended by Illuminating Engineering Society handbook or, as specified herein.
- .2 Provide local switching for enclosed rooms, e.g.: private offices, conference rooms, training rooms, etc. For large areas provide some switching arrangement to conserve energy.
- .3 Provide exterior security lighting for driveways, walks, and parking areas. Exterior lighting to be controlled by a time clock equipped with the astronomic feature and battery back-up. Provide a manual by-pass.
- .4 The 347-volt lighting system shall be controlled by means of a low voltage switching system, incorporating the following:
 - .1 Low voltage relay panels, located in strategic locations throughout the building. Panels to include a maximum of 10 relays, electrically operated

- by momentary pulse, mechanically latched, rated for 20A @ 347 volts, control transformer and suitable voltage barriers.
- .2 A line voltage disconnect switch, located in each classroom to provide isolation for the lighting system in that room only. Locate above ceiling, over doorway.
 - .3 Remote control switches, single pole, double throw, momentary contact, centre pivot rocker action, with LED pilot lights (red-on, green-off).
 - .5 All common area lighting shall be controlled by a switch located in one central location, with no local switching provided. These include corridors, stairways, washrooms, changerooms, etc.
 - .6 All luminaries are to be CSA approved for the intended use.
 - .7 Indoor Luminaries
 - .1 Fluorescent Luminaries.
 - .1 Fixture Type '1'. (Typical Main Classroom Luminaries).
 - .1 Specification grade housing, 2 foot x 4 foot, minimum 4.5 inches deep, PAF (paint after fabrication) polyester powder coat with 90% minimum reflectivity, hinged steel door frame complete with light leak gaskets, CSA approved.
 - .2 Lens to be 100% virgin acrylic, minimum 0.125 inch thick, with minimum low brightness.
 - .3 Electronic ballasts, CSA, CBM certified, energy efficient, ballast factor minimum of 0.91, THD less than 10%, sound rated 'A', power factor minimum 99%.
 - .4 Lamps to be T-8, initial light output of 2950 lumens, rated average life of 20,000 hours, colour temp. of 3500⁰K, CRI of 84.
 - .5 Three lamps, two outer lamps switched together, inner lamp switched separately.
 - .6 Suitable for recessing in T-bar ceiling.
 - .2 Fixture Type '2'. (Typical corridor Luminaries).
 - .1 Similar to Type '1' except:
 - .2 Two lamp, single level switching.
 - .3 Fixture Type '3'. (Typical Information Technology Luminaries).
 - .1 Similar to Type '1' except:
 - .1 Minimum 6.125 inches deep.
 - .2 RP-1 compliant. (preferred)
 - .3 Deep cell louver.
 - .4 Fixture Type '4'. (Typical classroom communication board luminaries).
 - .1 Similar to Type '1' except:
 - .1 1 foot x 4 foot.
 - .2 Open fixture.

- .3 Single lamp.
- .4 Specular reflector.
- .5 Fixture Type '5'. (Typical Building support space luminaries).
 - .1 Specification grade, commercial strip light.
 - .2 Electronic ballast (similar to Type '1').
 - .3 Lamps (similar to Type '1').
 - .4 Two lamp, complete with wire guard.
 - .5 Pendant mount.
- .6 Fixture Type '6'. (Typical Music Room, Cafeteria Luminaries).
 - .1 Specification grade, extruded aluminium housing, open, indirect/direct type, die formed specular aluminium 95% reflectance.
 - .2 Electronic ballasts (same as Type '1').
 - .3 Lamps (same as Type '1').
 - .4 Switching arrangements (same as Type '1').
 - .5 Pendant mount.
- .2 High Intensity Discharge Luminaries.
 - .1 Fixture Type '7'. (Typical Main Gymnasium Luminaries).
 - .2 Indirect, metal halide, vertical lamp.
 - .3 Housing to be constructed of spun aluminium. Reflector is constructed of spun aluminium, painted with a powder coat with a minimum 90% reflectance.
 - .4 H.I.D. ballast to be encased and potted, and meet or exceed the performance requirements of ANSI C8204.
 - .5 Pendant mount.
 - .6 Safety chains, and wire guard.
 - .7 One third of luminaires to be complete with quartz lamp.
- .3 Incandescent Luminaries.
 - .1 Fixture Type '8'. (Typical Gymnasium house Luminaries).
 - .1 Specification grade, open type, steel lamp holder compartment, prismatic clear glass reflector.
 - .2 Lamp - 200W A19.
 - .3 Suitable for pendant mount.
 - .4 Safety chains.
 - .5 Hinged wire guard.
- .8 Exterior Luminaries.
 - .1 Perimeter Security or Area Lighting.
 - .1 HPS lamp.
 - .2 Die Cast Aluminium Housing.
 - .3 Specular aluminium reflector.
 - .4 Low glare, sharp cut-off, distribution type as required to meet

- application.
- .5 Vandal resistant.
- .6 Moisture proof.
- .7 Capable of horizontal and vertical.
- .8 Suitable for wall or pole mount aiming.

7.17 Emergency Lighting and Exit Lighting

- .1 Provide emergency and exit lighting to conform to the requirements of the National Building Code of Canada, the CSA C22.1-98, Canadian Electrical Code, Part 1 Safety Standard for Electrical Installations and where specified in this document.
- .2 Wall mounted units are preferred.
- .3 Provide wire guards in all areas where subjected to physical damage.
- .4 Emergency Lighting:
 - .1 Provide emergency lighting in the kitchen, all change rooms, all washrooms, electrical and communications rooms, mechanical rooms and all other areas as required by code.
 - .2 Feed the emergency lighting system from the same circuit which feeds the normal lights in that area.
 - .3 Units shall incorporate sealed maintenance free battery, solid state charger, test switch, LED indicators for "on" and "charge", test switch.
- .5 Exit Lights
 - .1 LED light source 25 year life.
 - .2 Die cast aluminium housing.
 - .3 Must comply with CSA-C860-96.

7.18 Public Address and Interphone System.

- .1 Provide a Public Address & Interphone System including, but not limited to the following:
 - .1 Local Operating Network based, multichannel, microprocessor controlled communication system.
- .2 In all instructional areas provide:
 - .1 Call button to main office.
 - .2 Speaker
 - .3 Telephone handset.
 - .1 Allow direct dialling, two way conversations between areas equipped with telephone handsets.
 - .2 With the use of an access code, allow direct dialling to exterior telephones.
- .3 In corridors, stairwells, washrooms, change rooms, mechanical rooms and electrical rooms, provide:
 - .1 Sufficient number of speakers for announcements.

- .4 In administration areas provide:
 - .1 Two administration control consoles - one for principal, one for main office.
 - .2 Sufficient number of speakers for announcements.
 - .3 In Gymnasium/Cafeteria provide:
 - .4 Separate sound systems complete with speakers, microphones etc.
 - .5 Over-ride from principal's office to allow announcements in these areas.
 - .5 Provide exterior horns for announcements and class change tones on their own zone to enable disconnection.
 - .6 In the communications room provide Main control panel rack complete with control panel.
 - .7 Provide battery to allow announcements to be made for 30 minutes during a power failure.
 - .8 The main building public address system shall consist of, but not necessarily limited to the following components:
 - .1 Central control unit including equipment rack, digital and analogue cards, switching cards, power supply, power amplifier, system clock, tone generator, battery back-up.
 - .2 Administrative Telephone (ATEL) desk mounted, incorporating the following:
 - .1 Telephone handset.
 - .2 Microphone.
 - .3 Speaker.
 - .4 Volume control.
 - .5 16 character alphanumeric LCD display.
 - .6 Keypad controls.
 - .7 Clock.
 - .8 Function keys.
 - .9 Functions:
 - .1 ATEL to speaker (s) page.
 - .2 Tone Distribution.
 - .3 Configuration menu display.
 - .4 Audio program distribution control.
 - .5 Zone page.
 - .6 All call page.
 - .7 Emergency page.
 - .3 Program source unit including desk mounted equipment rack, AM-FM tuner and cassette player, and CD player.
 - .4 Speakers.
 - .9 The cafeteria / gymnasium public address system shall consist of, but not necessarily limited to the following components:

- .1 Equipment rack, 20 inch wide, 23 inches deep, and 77 inches high. complete with locking door front and rear.
- .2 Gym Mixer / pre-amplifier.
- .3 Gym Graphic equalizer.
- .4 Compressor/Limiter.
 - .1 Power Amplifiers.
 - .2 Power bars.
 - .3 Cafeteria mixer.
 - .4 Cafeteria Amplifier.
 - .5 Cassette player.
 - .6 CD player.
- .5 Speakers.
- .6 Assistive Listening Equipment.
- .10 Central Control Unit
 - .1 Multichannel, microprocessor controlled, programmable unit.
- .11 Program Source Unit.
 - .1 Desk mounted in rack.
 - .2 AM/FM tuner/cassette player.
 - .1 AM/FM Tuner.
 - .1 Controls and indicators on front panel:
 - .1 AM/FM tuning control.
 - .2 Power on/off switch.
 - .3 Interchannel hush in/out switch.
 - .4 AM/FM selector switch.
 - .5 Peak meter.
 - .6 FM zero center switch.
 - .7 Bass, treble, volume controls.
 - .8 Tuning meter for FM/AM.
 - .2 Receptacles on rear of panel:
 - .1 Auto output jack.
 - .2 AM/FM antenna connections.
 - .3 FM channel:
 - .1 Tuning range: 87.9 to 107.9 MHz.
 - .2 Signal to noise ratio: 70 dB.
 - .3 Frequency response: +/- 3 dB, 30-15,000 Hz.
 - .4 Stereo Separation: 35 dB at 1000 HZ.
 - .4 AM channel:
 - .1 Tuning range: 530 to 1650 kHz.
 - .2 Hum and noise level: 56 dB below 100% modulation.
 - .3 Frequency response: -6 dB at 4.0 kHz.
 - .4 Antenna: transformer with low impedance primary for use with external antenna wire.

- .5 Antenna:
 - .1 Provide antenna to obtain satisfactory signal.
- .3 Cassette Player:
 - .1 Tape Speed: 1 7/8 IPS.
 - .2 Response (+/- 3 dB) 35-12,500 HZ.
 - .3 S/N ratio: 52 dB.
- .4 Compact Disk player.
 - .1 Standard Audio CD player.
 - .2 Able to hold up to 5 CD at one time.
 - .3 Remote control unit.
 - .4 Frequency response 20-20 kHz, +/- 1 dB/-2.0 dB.
 - .5 Harmonic distortion: Less than 0.03% at 1 kHz.
 - .6 S/N ratio more than 100 dB.
- .12 Mixer/Preamplifier:
 - .1 Inputs:
 - .1 8 program inputs.
 - .2 1 bridging input/output.
 - .2 Controls:
 - .1 8 input level controls.
 - .2 Bass and treble controls.
 - .3 Master volume control.
 - .4 Tone control bypass switch.
 - .3 Output: 1 V rms into a 1600 ohm impedance.
 - .4 Frequency response: 20 - 20 kHz at 0.5% THD.
- .13 Graphic Equalizer
 - .1 31 active filters @ 20 - 20 KHZ.
 - .2 31 slide controllers through a range of +/- 12 dB.
 - .3 Adjustable high/low pass filters with a slope of 12 dB/octave and a high pass range of 10-400 Hz and a low pass range of 10 kHz to 30 kHz.
 - .4 Input impedance greater than 50,000 ohms.
 - .5 Distortion less than 0.1% @ 1 VRMS.
- .14 Compressor / Limiter
 - .1 Up to 45 dB of signal compression at ratios of infinity: 1 to 1:1 with variable attack times of 0.2 MS to 10 MS and release times from 0.5 sec. to infinity.
 - .2 Maximum output of 6 VRMS into 600 ohm load.
 - .3 Harmonic distortion: less than 0.5%.
 - .4 Frequency Response: 20-20 kHz +/- 0.5 dB.
- .15 Power Amplifiers
 - .1 Cafeteria Power Amplifier:
 - .1 Power Output: 250 watts rms.

- .2 Harmonic distortion: less than 0.5%, 45 to 20 kHz.
- .3 Frequency response: 20 to 20 kHz, (+0 - 1 dB).
- .4 Signal to noise ratio: greater than 90 dB below rated output.
- .2 Gymnasium Power Amplifier (1 required):
 - .1 Power Output: 450 watts.
 - .2 Harmonic Distortion: less than 0.2% at 1 KHZ.
 - .3 Frequency response: 10 - 65 KHz, +/- 3 dB at 1W.
- .16 Microphones (2 required)
 - .1 Omnidirection pattern.
 - .2 Dynamic element.
 - .3 Frequency response: 50 to 16000 Hz.
 - .4 Impedance: Low (150-250 ohms).
 - .5 Mic Switch: Line Shorting.
 - .6 Provide 2 table stands and 2 floor stands.
- .17 Classroom Telephones:
 - .1 Wall mounted unit complete with handset.
 - .2 DTMF keypad.
 - .3 Emergency / Quick dial buttons.
 - .4 Redial button, flash button.
 - .5 Extra long cord.
 - .6 Ringer volume switch.
- .18 Speakers:
 - .1 Hallway, Classroom, Mechanical & Electrical Rooms, washrooms, change rooms.
 - .1 Cone type: 8" diameter.
 - .2 Finish colour: white.
 - .3 Magnet: 6 ounce Ceramic.
 - .4 Range: 50 - 14 KHz.
 - .5 Impedance: 8 ohms.
 - .6 Power input to voice coil: 10W continuous.
 - .7 Complete with backbox, baffle assembly.
 - .8 Ceiling or wall mount.
 - .9 25 V line matching transformer.
 - .2 Gymnasium
 - .1 Three way units as follows:
 - .1 1-15 inch LF.
 - .2 1-6.5 inch MF.
 - .3 1-PZT Horn - HF.
 - .2 Frequency response: 40 - 20 KHz.
 - .3 Impedance: 4 ohms.
 - .4 Power rating: 200 W RMS.
 - .5 Complete with aluminum extrusion grille.

- .6 Finish colour: white.
- .7 Minimum number of units - 2.
- .3 Cafeteria
 - .1 Two way units as follows:
 - .1 1-8 inch LF.
 - .2 1-3 inch HF.
 - .2 Frequency response: 45-18 kHz.
 - .3 Impedance: 8 ohms.
 - .4 Power rating: 20 W RMS.
 - .5 Complete with backbox, baffler assembly, transformer.
 - .6 Finish colour: white.
 - .7 Minimum number of units - 4.
- .4 Exterior
 - .1 Horn Type: 8" wide, 8" high, 9" deep.
 - .2 Finish: beige baked enamel.
 - .3 Frequency response: 275 - 14 kHz.
 - .4 Impedance: 45 ohms.
 - .5 Power rating: 15 watts full range.
 - .6 Complete with adjustable mounting brackets, shockproof and weatherproof housing, transformer.
 - .7 Provide at least one unit per building exposure.

.19 Assistive Listening Equipment

.1 Gym/Cafeteria

.1 Rack mounted base station as follows:

- .1 Frequency Modulation.
- .2 XLR female switchable from 70 volt line, 600 ohm, line or microphone level MIC 200 ohms, -20 dB to - 60 dB (variable attenuator) Line 600 ohms, -2b to +3 dB (variable attenuator) Line 70.7 volts.
- .3 Automatic gain control range: 30 dB.
- .4 Signal to noise ratio: 58 dB.
- .5 Maximum radiated power: 50 mw.
- .6 Frequency band: 72-76 Mhz.
- .7 Frequency deviation: I 25 KhZ.

.2 Portable Transmitter

.1 Beltpack transmitter as follows:

- .1 Audio input characteristics:
 - .1 High level auxiliary: 27 mV.
 - .2 MIC level auxiliary: 3 mV.
 - .3 MIC/ANT Jack - Adjustable: 3 to 30 mV.
- .2 Automatic gain control: 40 dB
- .3 Signal to noise ratio: 45 dB.
- .4 2 AA batteries.
- .5 Maximum radiated power: 8000 micro volts/m at 100 feet.
- .6 Battery life: 30 hours NICAD.

.3 Receivers:

- .1 Sixteen channel model.
- .2 Power requirements: 2-AAA NICAD.
- .3 Quiescent current: 20 mA.
- .4 Sensitivity: 0.5 microvolt typical, 1.0 microvolt maximum, 12 dB SINAD.
- .5 Signal to noise greater than 65 dB.
- .6 Distortion: less than 2%.
- .7 Controls: volume, on-off, high frequency boost.
- .8 Various ear buds available.

7.19 Television & Media Retrieval System

.1 Provide a complete television and media retrieval system including but not limited to the following:

.1 CATV connection.

- .2 CATV Distribution Amplifier.
 - .3 Coaxial cable distribution system.
 - .4 Cable Television wall outlets.
 - .5 Outlets for internal television broadcast.
 - .6 Portable modulators.
 - .7 Colour television set
 - .8 Video/Data LCD projectors.
 - .9 Projector mounting brackets.
 - .10 Mobile Television Carts.
 - .11 Media source rack.
 - .12 VCR's.
 - .13 Interconnection between television cable and media source device rack.
 - .14 Media Retrieval system c/w complete with, but not limited to the following:
 - .1 System control processor. (SCP).
 - .2 System Administrator and Communication router. (SA,CR).
 - .3 Module concentrators.
 - .4 Classroom control units c/w handheld (IR) remote control units.
 - .5 Serial source control modules.
 - .6 Input/output source control module.
 - .7 Software as specified.
 - .8 Interconnecting wiring, connectors, etc to provide a fully working system.
 - .15 Digital White Boards.
 - .16 RS232 Data Switches.
 - .17 RF tuners.
 - .18 VGA Distribution Amplifiers.
 - .19 Closed captioned decoders.
 - .20 Equipment wiring and all connections.
- .2 Media Source Rack:
- .1 21 inch wide, 18 inch deep, 81 inch high, suitable for mounting racks of equipment.
- .3 Video Cassette Recorders
- .1 VHS standard format.
 - .2 Four head.
 - .3 On screen programming.
 - .4 Wireless remote.
 - .5 Commercial model.
- .4 Internal Television Broadcast Capability:

- .1 Provide two portable modulators (MAVM's), each mounted on a separate wide body, TV cart. The modulators shall be equipped with wiring and connectors to allow connection to internal broadcast outlets.
- .5 Video/Data LCD Projectors:
- .1 Provide video/data projectors with the following features:
- .1 Brightness - 600 ANSI Lumens, minimum.
 - .2 Resolution - 800 x 600 (SVGA).
 - .3 Amplifier/speaker - 3 watt stereo, minimum.
 - .4 Ceiling mountable .
 - .5 Motorized Keystone/lens shift.
 - .6 Lamp peak life (hours) - 3,000.
 - .7 Motorized focus .
 - .8 Mouse control .
 - .9 Pointer .
 - .10 Remote control .
 - .11 UL commercial listed.
 - .12 Zoom lens - 1:1.5 power.
 - .13 Noise rating - less than 42 dB when operating.
 - .14 Terminals:
 - Computer Input (HDB15) x 2.
 - Computer Audio Input (Mini Jack) x 2.
 - Computer output (HDB15).
 - S-Video Input (Din 4).
 - AV input (phono).
 - AV monitor output (phono)
 - Ext. speaker output (minijack).
 - Control port output x 2.
 - .15 Extended 5 year warranty.
- .2 Provide suitable mounting bracket.
- .6 Colour Television Set:
- .1 Provide one colour television set (14 inch) adjacent media source rack. The following features shall be incorporated into each set:
- .1 Stereo receiver.
 - .2 On screen menu display.
 - .3 Wireless remote control.
 - .4 Closed caption/text mode.
 - .5 Video 'S' input.
 - .6 180 channel tuner.

.7 DVD Player

- .1 Provide one DVD player on media source rack.
 - .1 NTSC
 - .2 DVD Video
 - .3 Video : Capable of 500 lines horizontal resolution.
: S/N - 85 dB
 - .4 Audio : 20 bit linear PCM sound
: S/N - 100 dB
 - .5 Wire less remote control (IR).
 - .6 Rack mount adaptor.
 - .7 Commercial model.

- .8 Provide a complete television distribution wiring system, including cables, conduits, outlets, splitters, taps, etc. to allow interconnection of all video/data LCD projectors to the T.V. distribution system , connection between the T.V. distribution system and the media source device rack, and connection between the internal broadcasting system and the main television distribution system.
- .9 Provide at each Video/Data LCD projector and at the media source rack television set location, one classroom control unit. Provide all wiring between these units and the module concentrator units. Interconnect each control unit to its respective LCD projector and T.V. monitor.
- .10 Provide one RF tuner and closed captioned decoder for each Video/Data LCD projector and connections between coax cable and projector.
- .11 .Provide one Distribution Amplifier for each Video/Data LCD projector and connections between amplifier and wall box.
- .12 Provide one printer adjacent to the System Administrator. Provide required cable and connectors. Printer shall have as a minimum the following features:
 - .1 Inkjet printer.
 - .2 600 x 600 DPI. (Black only).
 - .3 Up to 600 x 300 DPI Black & Colour.
 - .4 PPM (Black), 1.5 PPM (Colour).
 - .5 512 KBYTE Built-in Memory.
- .13 Provide a media retrieval system.
 - .1 The system shall provide advanced information management, media distribution,remote scheduling and control capabilities to individual rooms within the building. In addition, the system shall provide the

capability for future multiple building interface and control. The system consists of the following building blocks:

Database Server

System Administrator Client Software

Communications Router

Module Concentrator(s)

Network Client Software

Control modules for serially-controlled media source devices (S-SCMs)

Control modules for monitoring contact closures (I/O-SCMs)

Control modules for infrared-controlled media source devices (I-SCMs)

Classroom Control Modules (CCMs) located in each room

.2 DATABASE SERVER, ADMINISTRATOR CLIENT SOFTWARE, COMMUNICATIONS ROUTER, AND MODULE CONCENTRATOR (HEADEND)

- .1 The primary system headend components are the Database Server, the System Administrator Client, and Communications Router.
- .2 The System Administrator Client shall use a Graphical User Interface (GUI) which supports pulldown menus, pop-up menus, and customizable toolbars, allowing the media coordinator or other designated individuals to schedule media source devices for individual rooms. The System Administrator Client shall support all GUIs, including those on the Media Library Database, Usage Statistics, and other system software modules.
- .3 The Communications Router shall be interfaced to the network. It shall provide control signals to all media source devices and handle all function requests from the room Handheld Infrared Remote Control units. When a menu item is selected, the system control software shall automatically switch the display device to the correct channel. A communications link shall also be established with the media source device to allow control of that device from the individual room.

- .4 The Module Concentrators shall have 16 universal ports each and support up to 512 universal ports per system. The Module Concentrators shall support daisy-chain installation and remote application of all communication functions. The system shall support remote location and control of media source devices.
 - .5 The Communications Router shall control all Module Concentrator functions by polling each device to determine its current status. Each Module Concentrator shall include local intelligence so that all operational parameters are uploadable to each Module Concentrator and can be changed by the media coordinator from the System Administrator Client.
 - .6 In the classroom, the system shall use client software to control the RS-232 I/O port of the local client PC to provide the communication interface required to communicate with and control the media source devices and system room control equipment.
- .3 The system Video Generator Module (VGM) shall allow the transmission of classroom menus to all rooms. The system shall allow all rooms to view the classroom menu pages displaying all current scheduled events and shared resources automatically. The classroom menu pages shall be generated by a multi-output type display, showing schedule information, instructor identification, source information, media title information, and control key identification. The classroom menu screens are activated by the Menu key on the Handheld Infrared Remote Control.
- .4 The system shall be capable of synchronization to a master clock.
 - .5 The database server shall be connected to a master clock system to maintain time and bell consistency with scheduled media and classroom clock displays. All classroom control modules which have six-character LED matrix displays are synchronized to the local communications router in each school connected to the system network. All classroom control modules shall display the correct time even when the room LCD projector is off.
 - .6 The system shall allow users to enter current media inventory information into a database.
 - .7 Once the database is populated, the system shall provide the ability to search the database for specific records, and to generate and print reports. Any records found can be added directly to the scheduling subsystem for

setting up a scheduled event. Found records shall be viewable as a list or individually when more information is needed. Searches can be conducted based on specific fields.

.8 Video Paging

The system shall provide the ability to display a video and audio message on all paged display devices. The system shall support the use of any dedicated source or externally-triggered source to send the selected page information to all rooms or groups of rooms. The media coordinator shall define the video paging setup using the GUI software on the System Administrator Client. Access to video paging shall be password controlled.

Video paging shall take control of the designated room Video/Data LCD Projector, sense their status (on/off), set audio levels to a predetermined level, and pause all active sources at the start of the page. At the end of the page, the entire system shall be returned to its status prior to the video page activation.

The system paging module shall be compatible with all Video/Data LCD Projectors and shall not be type/brand/model specific.

- .9 The system shall allow the future sharing of resources across multiple schools.
- .10 The Module Concentrators interface to the SCM's (I-SCM, I/O-SCM, S-SCM) The I/O-SCM also monitors contact closures for remote all call page control.
- .11 The system shall provide serial communication capabilities between the CCMs and the Database Server. These capabilities shall allow users to access and control scheduled, global, and auxiliary media source devices, including VCRs, and DVD players from their rooms using the Handheld Infrared Remote Control.
- .12 The system shall provide for connection to a local area network for all client/server activities.
- .13 The system shall provide users with the ability to incorporate and control multiple media source devices in their daily curriculum from their own room. The media coordinator, schedules the use of media source devices and media on the System Administrator Client.

- .14 CCM (Classroom Control Module) - One-inch high (2.5 cm), six-character, 5 x 7 dot-matrix LED display that provides visual confirmation of command functions, messages, digital clock, elapsed time, count-up timer and countdown timer. Includes serial connection port, IR (infrared) output port, power sensing port, room Video/Data LCD projector control.
- .15 Each room is equipped with a CCM, and a Handheld Infrared Remote Control. The system handheld infrared remote control shall have a minimum of 41 individual keys and shall support multiple features, including two levels of cursor control, timer functions, menu key, eight source selection keys (A through H), and room Video/Data LCD projector functions including volume, power, mute, and local video.
- .16 The local instructor workstation (IBM, Apple, or compatible) shall use a client application which provides the user with a GUI-based control screen. The instructor shall select the menu screen and locate the desired media device from the GUI images provided. Upon selection of the media device the instructor shall have full control of the device using the pointing device, or handheld IR Remote.

.14 Digital White Boards

- .1 Rigid Body Model - minimum of 72" diagonal active area.
- .2 Standard dry erase markers & eraser.
- .3 Smart Stylus.
- .4 Cables & Connectors.
- .5 Electronic Pen Tray.
- .6 Power supply.
- .7 Operating software.
- .8 Wall mounting bracket.
- .9 Five year warranty.

7.20 Structured Wiring System

- .1 Provide a complete Local Area Network (LAN) including both active and passive components in consultation with the Local School Board and the Department of Education and Culture.
- .2 Reference Standards
 - .1 CSA T530.
 - .2 CSA T527.
 - .3 CSA T529-95.
 - .4 TSB 67.

- .5 Nova Scotia Government Structured Cabling Standards.
- .3 Provide a complete structured cabling system to carry voice and data . System components include but may not be limited to the following:
- .1 Equipment racks.
 - .2 Modular Patch Panels.
 - .3 Patch cords.
 - .4 Category 5 UTP wiring (FT-4 rated).
 - .5 Backbone cabling. (Voice and Data).
 - .6 Optical Fiber Backbone Cabling.
 - .7 Cable management.
 - .8 Information outlets and faceplates.
 - .9 IDC connectors and mounts.
- .4 Warranty
- .1 The minimum warranty requirement will be 15 years for the network. Upon completion, a certification certificate stating the warranty of the system must be presented.
 - .5 All products installed in this system must be part of a complete end to end solution by a single manufacturer.
- .6 Copper Voice Backbone System
- .1 Cable
 - Category 3-24 AWG voice riser cable.
 - CMS (FT4 Rated).
 - .2 Patch Panels
 - High density 24 port (1U) and 48 port (2U) RJ45 patch panels.
 - EIA-310-D 19" Mount Compliant.
 - Wiring Configuration T568A (ISDN).
 - Terminated 2 pair per port.
 - CSA T529-95 Category 5 Compliant.
 - .3 Distribution Connectors
 - 25 pair IDC punch down connector with 5 pair marking.
 - CSA T529-95 Category 5 Compliant.
 - .4 Distribution Mounts
 - 250 pair capacity capable of accepting ten (10) distribution connectors.
 - 2 D-rings to be included for each mount.
 - .5 Demarcation Field
 - .6 - Consisting of four 25 pair RJ21 male cables to 25 pair distribution connectors.
- .7 Copper Data Backbone System
- .1 Cable
 - 24 AWG 4 pair category 5 cable.
 - CMS (FT4 Rated).
 - Blue Outer Jacket.

- CSA T529-95 Category 5 Compliant.
- .2 Patch Panels
 - High density 24 port (1U) and 48 port (2U) RJ45 patch panels.
 - E1A-310-D 19" Mount Compliant.
 - Wiring Configuration T568A (ISDN).
- .8 Fibre Optic Data Backbone System
 - .1 Cable
 - 12 strand 62.5/125 micron Multimode OFNR fibre optic cable.
 - CMS (FT 4 Rated).
 - Blue Outer Jacket.
 - CSA T529-95 Category 5 Compliant.
 - .2 Patch Panels
 - High density 12/24 port (1U) SC patch panels.
 - E1A-310-D 19" Rack Mount Compliant.
 - Complete with 6 port single density SC adapter plates.
 - Complete with Plexiglas Front Cover.
 - CSA T529-95 Category 5 Compliant.
 - .3 Connectors
 - .4 - SC Type Connector with ceramic ferrule.
 - .5 - CSA T529-95 Category 5 Compliant.
- .9 Horizontal Cabling System
 - .1 Cable
 - 24 AWG 4 pair category 5 cable.
 - CMS (FT4 Rated).
 - Blue Outer Jacket.
 - CSA T529-95 Category 5 Compliant.
 - .2 Patch Panels
 - High density 24 port (1U) and 48 port (2U) RJ45 patch panels.
 - E1A-310-D 19" Mount Compliant.
 - Wiring Configuration T568A (ISDN).
- .10 Communication Outlet
 - .1 Faceplate
 - Single Gang faceplate.
 - Grey in colour.
 - Minimum of 4 ports per plate.
 - Blank to be supplied for unused port.
 - CSA T529-95 Category 5 Compliant.
 - NORDX/CDT MDVO series or equivalent.
 - .2 Inserts
 - 8 position UTP category 5 module.
 - IDC-type connection.
 - CSA T529-95 Category 5 Compliant.

- Blue in colour for voice.
- Grey in colour for data.
- Wiring Configuration T568A (ISDN).

.11 **Rack and Cable Management Systems**

.1 **Racks**

- 19" Heavy Duty Relay Rack.
- E1A-310-D 19" Mount Compliant.
- 84" in height.
- 48 rack units.

.2 **Horizontal Cable Management**

- E1A-310-D.
- 1 U (rack unit)

.3 **Vertical Cable Management**

- Minimum dimensions of 4"x 6".
- Hinged Front Door.
- Two per rack.

.4 **Patch Cables**

.5 **Copper Patch Cables**

- 4 pair, 24 AWG Stranded Wire, 8MOD-8MOD
- CSA T529-95 Category 5 Compliant.
- Wiring Configuration T568A (ISDN).
- Blue in Colour.
- 4' in length for green field to blue field.
- 4' in length for silver field to hubs.
- Provide quantity of patch cords to meet immediate requirement plus 20%.

.6 **Fibre Patch Cables**

- Dual Zip SC-SC 62.5/125 micron multi-mode fibre patch cable.
- 10' in length.
- CSA T529-95 Category 5 Compliant.
- Provide quantity of patch cords to meet immediate requirement plus 20%.

7.21 Intrusion Alarm System

- .1 Provide an intrusion alarm system consisting of door contacts, motion detectors control panel, keypads, etc.
- .2 Provide system coverage to all areas of the building accessible at grade through windows and/or doors.
- .3 Provide a digital keypad for by-pass operation at main entrance.
- .4 The keypad shall be either mounted in an enclosure or located in a nearby accessible room such as in administration area.
- .5 Wiring shall be in EMT.

- .6 Provide all necessary equipment (ULC dialer, etc.) to connect intrusion alarm system to a ULC approved monitoring firm.

7.22 Telephone System

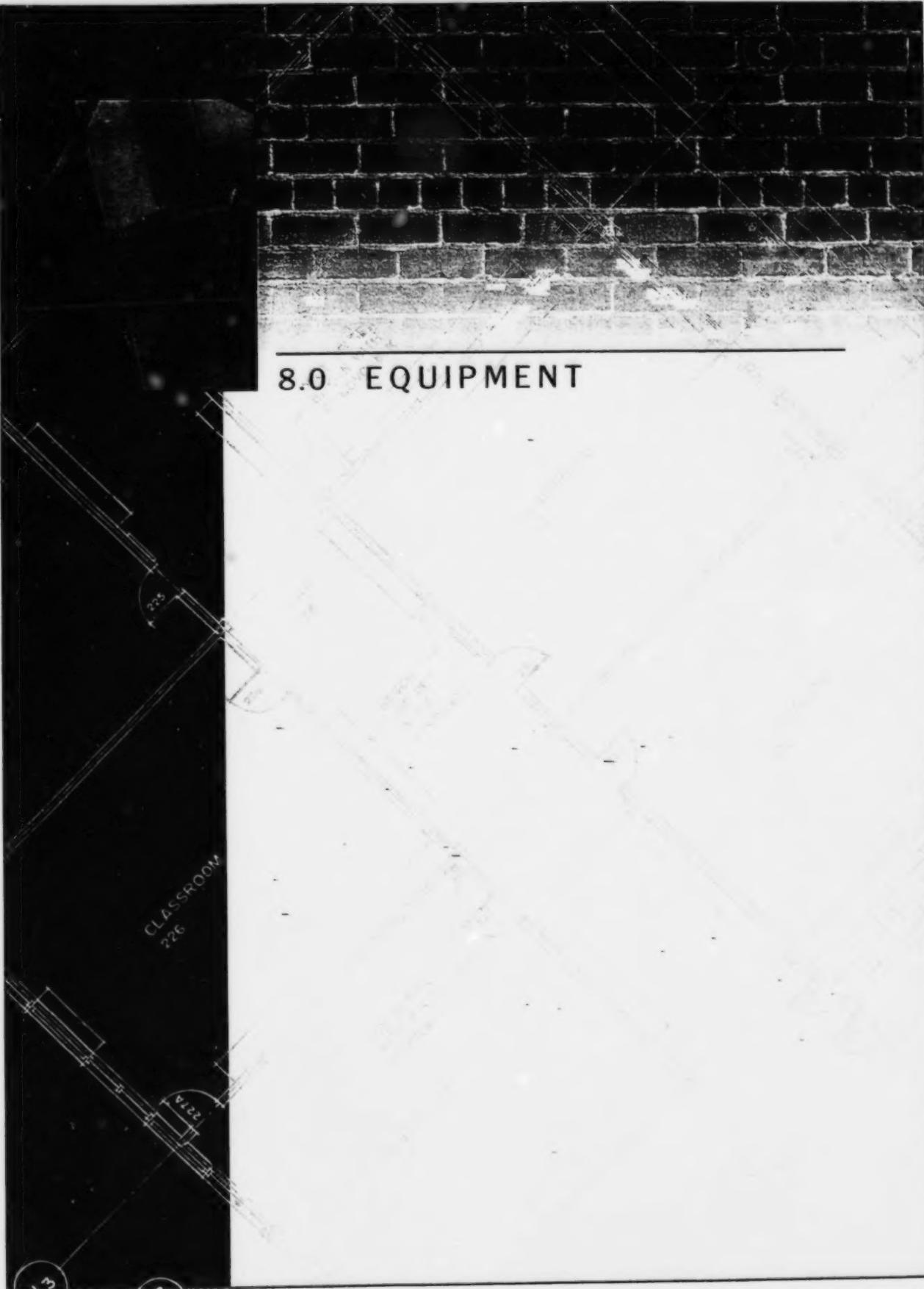
- .1 Provide a telephone system in consultation with the Local School Board, Department of Education and Culture, government telecommunications agency and the local Telephone Company.
- .1 Provide telephone equipment and communications closet as required. All horizontal telephone cabling shall meet or exceed category 5 requirements as per the Nova Scotia Government Structured Cabling Standards.

7.23 Fire Alarm System

- .1 Provide a fully supervised, single stage, multi-zoned, analog, addressable, multiplexed, microprocessor based fire alarm system.
- .2 System shall include, but not be limited to the following:
- .1 Central Control Unit in separate enclosure with power supply, stand-by batteries, central processor with microprocessor and logic interface, main system memory, input-output interfaces for alarm receiving, annunciation/display, and program control/signalling.
- .2 Power supplies.
- .3 Initiating/input circuits.
- .4 Output circuits.
- .5 Auxiliary circuits.
- .6 Wiring.
- .7 Manual and automatic initiating devices.
- .8 Audible signalling devices.
- .9 Local annunciator.
- .10 Fire Door Holders.
- .11 Visual Signalling Devices.
- .12 End-of-line resistors.
- .13 Active LED Graphic Announcer.
- .14 ULC monitoring service connection.
- .3 System components shall be listed by ULC and comply with applicable provisions of National Building Code Provincial Building Code, and meet requirements of local authority having jurisdiction.

- .4 All fire alarm system wiring shall be installed in conduit.
- .5 Provide a UL listed Fire Control Communicator (FCC) to interface the fire alarm control panel to the telephone system, to allow remote monitoring of both system alarms and trouble indications from a ULC approved monitoring agency.
- .6 Ensure signal devices are audible in all areas, including washroom/change rooms.

8.0 EQUIPMENT



8.0 EQUIPMENT

Note: 1

This is a list of the built-in equipment required in a school. All items are required in every school unless indicated by a note such as "high schools only", etc. There may be other items not listed herein that are required to deliver the educational program. These will be provided under "furniture, fixtures and equipment". Provide installation, mechanical connections, and electrical power etc., as required for all equipment items whether specified here or supplied under "furniture, fixtures and equipment".

Note: 2

Trade names are listed herein in order to provide a standard of acceptance. Should alternative products be proposed, be prepared to demonstrate that the alternate meets or exceeds these standards of acceptance.

Note: 3

All equipment installed in Schools shall be CSA approved.

8.1 KITCHEN EQUIPMENT

8.1.1 COORDINATION:

- .1 Coordinate kitchen equipment with food service provider where applicable.

8.1.2 MATERIALS AND COMPONENTS

- .1 Stainless Steel: to CSA ASTM A167-82, Type 304 with No. 4 finish unless otherwise indicated.
- .2 Stainless Steel Tubing: to ASTM A269-83, Type 302 commercial grade, seamless welded with No. 4 finish.
- .3 Fastenings: for securing corrosion resistant or plated metal parts to be as corrosion resistant as, and colour matched to materials being fastened. Fastenings used for securing unplated ferrous metal or wood parts are to have a minimum protective coating of cadmium or zinc. Where possibility of food or food acid contact, plating to be chromium; cadmium, zinc or other toxic coatings not accepted.
- .4 Chrome and Nickel Plating: to ASTM B456-79 Service Condition Number SC 3, polished finish.
- .5 Sealant: aluminum coloured sealing compound such as Dow Corning Silastic 732 RTV silicone adhesive sealant, to meet requirements of the National Sanitation Foundation (NSF) for

direct contact with food, and stay flexible during long term exposure to temperatures ranging from - 73.3 deg. C. to 232.0 deg. C. Seal all back-splashes to walls.

8.1.3 FABRICATION

- .1 Fabricate work square, true, straight, to fit conditions and as indicated. Design is to afford maximum sanitary conditions and is not to have any areas where disease causing bacteria may accumulate.
- .2 Fabricate equipment from stainless steel, except as otherwise indicated.
- .3 Fit and shop-assemble equipment ready for erection where possible.
- .4 Carefully deburr and smooth new edges. Sharp or rough edges will not be acceptable.
- .5 Straight Lengths: Counter tops, table tops, drain boards, tray rails, shelving and the like to be one continuous piece if 10' or less in length. If over 10', stainless steel sections to be welded, including field joints, unless otherwise indicated.
- .6 Welding: to be sound, non-porous, and free from imperfections. Weld metal to be colour matched to, and be as corrosion resistant as the parent metal. Spot welds, if any, to be minimum 1/8" diameter and have full penetration. All exposed welds to be ground smooth and polished to match parent metal. All other welds to be ground smooth. The welding or finishing is not to impair the corrosion resistance of the finished article. All welds, except spot welds, are to be continuous unless otherwise indicated.

8.1.4 SCHEDULE OF EQUIPMENT

- .1 Dish tabling
 - .1 Custom built or Diamond Metal, 30" wide x 36" high.
 - .2 All stainless steel construction 16 ga.
 - .3 Include sinks as per plans.
 - .4 Stainless steel tops with stainless steel legs and under shelving indicated. Reinforced, front up and rolled, ends turned down into dishwasher and sink drain board. Raised splash back.
- .2 Dish Rack
 - .1 Overshelf
 - .1 Stainless steel sloped suited to hold 2 standard dish racks
 - .2 Acceptable Manufacturer: Diamond Metal
 - .3 Dishwasher
 - .1 Single tank door type, straight through operation c/w 2 dish

- racks, 2 cup and bowl racks, and built-in electric booster.
- .2 Construction: stainless steel tank and hood with welded steel base and stainless steel adjustable legs.
- .3 Acceptable Product: Blakeslee Model D-8-B or Hobart AM 14 WB
- .4 Clean Dish Tabling and Pot Sinks
- .1 Two Compartment Pot Sink: 16 ga. stainless steel all-welded construction on galvanized legs; overflow, drains and guard.
- .2 Pot sink to be continuous with adjacent counter top. Sink to be integral with counter top. Pot sink to be complete with stainless steel slats to accommodate 20" x 20" tray and basket inserts.
- .3 Acceptable Product: Diamond Metal or Royal Food equipment Model PVS-48-16.
- .4 Freezer
- .1 Reach-in freezer: 45 cubic feet capacity, two section c/w full door and six vinyl coated shelves; 6" adjustable legs, digital thermometer, defrost indication and door activation light and condensation pan.
- .2 Finish: stainless steel exterior, white interior.
- .3 Electrical Characteristics: 120 volt, single phase.
- .4 Quantity: one only.
- .5 Acceptable Product: Foster Model GL-50-AD-T or Curtis RF-2-TM.
- .5 Shelving
- .1 Wire shelves, five tier high on 72" posts with "s" hooks at corners to permit unobstructed access.
- .2 One side and back 24" wide. Other side 18" wide. Lengths to fit room as per plan, confirmed by site dimensions.
- .3 Finish: Zinc plated.
- .4 Quantity: one lot.
- .5 Acceptable Product: Cari-All.
- .6 Refrigerator
- .1 Reach-in Refrigerator: 45 cubic feet capacity; two sections c/w full doors and six vinyl coated shelves; 6" adjustable legs. Digital thermometer and door activation light.
- .2 Finish: stainless steel exterior, white interior.
- .3 Electrical Characteristics: 120 volt, single phase, cord and plug, complete with condensation pan.
- .4 Acceptable Product: Foster Model GH-50T or Curtis, RR-2-TM.
- .7 Work Table as required.

- .1 All stainless steel utility unit/work table, stainless steel top and back-splashing overshelf, one drawer, provision for two ingredient bins.
- .2 Size: 60" long x 32" deep x 35" high.
- .3 Acceptable Product: Diamond Metal or Royal Food Model UUSC-60-D.
- .8 Heavy Duty Range - Two Required
 - .1 Heavy duty ranges c/w oven base; adjustable sanitary legs. One with hot top and oven base and one with 24 x 24 combination top with two heat zones and two 8 1/2" dia. tubular elements.
 - .2 Finish: Stainless steel front and back guard, baked enamel sides.
 - .3 Electrical Characteristics: 208 volt, three phase.
 - .4 Quantity: two only.
 - .5 Acceptable Product: Garland Model 10-20 R and 10-17 R or Vulcan equal
- .9 Note: This item requires an exhaust hood, provided by Mechanical.
- .9 Microwave Oven
 - .1 Commercial stainless steel in and out heavy duty, 0.6 cu.ft. interior 1000 watts, programmable, Panasonic NE 1057C.
- .10 Overshelf for Hot Food Table
 - .1 All stainless steel construction.
 - .2 Provide one infrared heat lamp.
 - .3 Complete with sneeze guard.
 - .4 Acceptable Product: Diamond Metal or Royal Food Equipment.
- .11 Hot Food Table
 - .1 All stainless steel water pan electric steam table with open base, c/w stainless steel pans and covers and 1/2" drains 10" wide maple cutting board and sneeze guards.
 - .2 Provide one section 2-1/2 size pans 6" deep; one section full size pan 4" deep; one section 3-1/3 size pans 2" deep; 2 full size pans 2" deep complete with covers.
 - .3 Acceptable Product: MKE-HFT-46AW or Diamond Metal.
- .12 Pass Through Shelf
 - .1 All stainless steel construction by General Contractor. See details on drawings.
- .13 Tray Rail
 - .1 Stainless steel tray rail as per drawings.
- .14 Work Table with Sink
 - .1 All stainless steel utility unit/work table complete with stainless steel top and integral sink, overshelf and undershelf

- .2 and drawer.
- .2 Size 72" long x 32" deep x 35" high.
- .3 Trim by Mechanical.
- .4 Acceptable Product: Diamond Metal or Royal Food, Model UUSC-60-D.
- .15 Pot Rack
 - .1 All stainless steel construction.
 - .2 Table mounted to lower shelf.
 - .3 Complete with "S" hooks @ 6" o.c.
 - .4 Size: 66" long x 18" wide.
- .16 Bakers Table
 - .1 All stainless steel utility unit/work table c/w laminated top, and over shelf.
 - .2 Size: 48" long x 32" deep x 35" high.
 - .3 Acceptable Product: Diamond Metal Royal Food, Model UUSC-60-D.
- .17 Ingredient Bins
 - .1 Heavy duty plastic bins for bakers table.
 - .2 Acceptable Product: Diamond Metal Rubbermaid 3600.
- .18 Vegetable Sink
 - .1 Single compartment vegetable sink with integral left hand drain board c/w overflow, drain and perforated guard.
 - .2 Construction: 16 ga. stainless steel all-welded construction on galvanized legs.
 - .3 Acceptable Product: Diamond Metal or Royal Food equipment Model PVS-24-16 sink with DO-24 left hand drain board.
- .19 Glass Front Fridge
 - .1 Reach in refrigerated storage cabinet c/w 2 glass doors, florescent lighting, 6 heavy duty shelves.
 - .2 White inside and out.
 - .3 Electrical characteristics: 1/3 hp, single phase, 115V.
 - .4 Acceptable Product: Kelvinator DDC37R.
- .20 Sandwich Table
 - .1 Refrigerated sandwich prep. table.
 - .2 Acceptable Product: Silver King #SKSB-7F

8.1.5 ADDITIONAL ITEMS THROUGHOUT THE SCHOOL

Note: For locations and quantities, see specific room locations (Section 3.5)

- .1 Domestic Fridge
 - .1 Standard domestic no frost refrigerator, colour: white
 - .2 Capacity: 20 cu.ft.

- .3 Acceptable Product: Maytag #RSD2000C.
- .2 Microwave Oven
 - .1 Commercial grade, 0.8 cu.ft., 800 watts c/w defrost option.
- .3 Dishwasher
 - .1 Standard domestic automatic built in model c/w rinse agent and detergent dispensers and fan forced air drying.
 - .2 Plumbing requirements 1/2" hot, 1/2" drain
 - .3 Electrical Characteristics 120V
 - .4 Acceptable Product: Maytag DIVU 9920, deco white.
- .4 Wall Oven:
 - .1 Single built-in wall oven complete with glass door, clock with timer, easy cleaning oven and broiler pan and grill.
 - .2 Size 24" wide x 32" high x 24" deep.
 - .3 Electrical Characteristics: 208V, single phase, 5.2 KW.
 - .4 Acceptable Product: Maytag, CWF 9000.
- .5 Cooktop (Counter-top Stove)
 - .1 Porcelain finish cooktop unit c/w 2-8" coil elements and 2-6" coil elements, infinite heat controls.
 - .2 Size: 30" wide x 5" high x 22" deep.
 - .3 Acceptable Product: Maytag Model CSE 7000.
- .6 Electric Range
 - .1 Standard domestic 30" Model c/w baking oven and glass window, timer, two 6" and two 8" flat surface elements.
 - .2 Acceptable Product: White Maytag #CRE 7600 BDW
- .7 Washer
 - .1 Standard domestic automatic washing machine; 2 speeds, 2 cycles, heavy duty motor.
 - .2 Acceptable Products: Maytag Model LAT-9804.
- .8 Dryer
 - .1 Standard domestic automatic dryer: 3 cycle selection, 4 temperatures, heavy duty.
 - .2 Acceptable Product: Maytag Model LDE 9824.

8.1.6 INSTALLATION

- .1 Install equipment in accordance with manufacturer's printed instructions.
- .2 Co-ordinate connection of mechanical and electrical services.
- .3 Adjust equipment for smooth and proper operation.

8.2 GYMNASIUM AND SPORT EQUIPMENT

8.2.1 SPECIALTY PRODUCTS

- .1 Provide reinforcing, fastenings and anchorage required for building

in of products.

- .2 Insulate between dissimilar metals, and metal and masonry materials to prevent electrolysis with bituminous paint to CGSB-1-GP-108M or with methacrylate lacquer, 1-GP-159 if exposed to view.

8.2.2 GYM BASKET BALL EQUIPMENT

- .1 Two ceiling suspended swing up basketball backstops c/w official glass rectangular backboard, regulation 18" diameter reflex breakaway goal, electric winch, foam safety edging, backstop safety belts and all mounting accessories. Frame width to accommodate rectangular board (approx. 63"). Adjustable H.D. net (8'-0" and 10'-0" AFF).
- .1 Standard of Acceptance: Kodiak Industries, RS 110-U, painted white.
- .2 Acceptable Alternate Manufacturer: Madsen Sheridan, Laurentian: Gymnaisum & Health Equipment
- .2 Two ceiling suspended swing up basketball backstops complete with regulation fan shaped steel backboard, regulation 18" dia. goal, backstop safety belts, electric winch and all mounting accessories.
- .1 Standard of Acceptance: Laurentian Gymnastic Industries, Model LG-50BB;
- .2 Acceptable Alternate Manufacturer: Madsen-Sheridan, Royal Steward, Kodiak
- .3 Two wall mounted side-swing basketball backstops c/w rectangular shaped steel backboard, regulation 18" dia. goal and all mounting accessories.
- .1 Standard of Acceptance: Kodiak RS-119 HD, painted white adjustable height (8'-0" and 10'-0").
- .2 Acceptable Alternate Manufacturer: Madsen-Sheridan, Laurentian: Gymnaisum & Health Equipment

8.2.3 VOLLEYBALL POSTS AND NET

- .1 Provide two sets competition volleyball posts and nets. Posts to be self-supporting requiring no guy wires.
- .1 Two pair Spieth Anderson #226EW/EH "Sport Plus" end posts
- .2 Two pair Spieth Anderson #219 post padding
- .3 Two each Spieth Anderson #221 judge's stand
- .4 Two each Spieth Anderson #207 judge's stand padding
- .5 Six each Spieth Anderson #214 VB floor sockets
- .6 Two each ICS - VBN-500 Championship volleyball net

- .7 Two pair ICS - VNA-100 net antenna
- .2 Provide four sets cross court volleyball posts and net for recreational Courts.
 - .1 Four pair end posts: Laurentian 500202/Centaur @158E
 - .2 Four centre posts: Laurentian 500201/Centaur C158C
 - .3 Six nets: International Cordage Systems ICS VBN 300
 - .4 Floor sockets as required.
 - .5 Alternate Manufacturers: Madsen, Sheridan, Gymnasium and Health Equipment to meet specified requirements.

8.2.4 BADMINTON POSTS AND NETS

- .1 Provide four sets of badminton posts and nets each as follows:
 - .1 Four PV posts: Laurentian 500111/Centaur C160B
 - .2 Eight floor sockets: Centaur C164
 - .3 Four nets: International Cordage Systems ICS BN-275
 - .4 Alternate Manufacturers: Madsen, Sheridan, Gymnasium and Health Equipment to meet specified requirements.

8.2.5 INDOOR COMBINATION GOLF/ARCHERY NET

- .1 Provide and install two indoor combination golf/archery nets.
- .2 Approximately 42' long and 26' high - Co-ordinate with site conditions.
- .3 Provide track as required. Centaur Channel Master Walk Draw "U"
- .4 Provide all necessary hardware for manual operation.
- .5 Provide pulleys and cleats to store nets up high on walls.
- .6 Netting: closed weave Archery Net: International Cordage Systems ICS 2420
- .7 Acceptable Alternate: Quality Storage Drapery "Hull Divider" with "Vilna" flameproof netting.

8.2.6 GYMNASIUM DIVIDER CURTAIN

- .1 Provide one fold-up divider curtain; material: vinyl coated, single wall polyester rated as flame retardant by ULC. The curtain shall be vinyl for the first 10 ft. from the floor and the balance shall be 1 1/4" vinylized netting. Curtain c/w electric winch, key switch, track and hardware and all mounting accessories. Size: approximately 70 ft. wide x 30 ft. high (confirm on site) Colour selected by Architect.
- .2 Provide the following additional features:
 - .1 Extra heavy duty chain supports
 - .2 Heavy duty "S" hooks
 - .3 Stainless steel pulleys

- .3 Acceptable Manufacturer:
 - .1 Madsen-Sheridan
 - .2 Centaur
 - .3 C.S.I.
 - .4 Quality Stage Drapery

8.2.7 SCOREBOARD

- .1 Provide one table model scoreboard, flip style, 21" x 17".
 - .1 Standard of Acceptance: Athletes Wear BD-0215.
 - .2 Acceptable Alternate Manufacturer: Gymnasium and Health Equipment

8.2.8 PEG BOARDS

- .1 Provide one kiln-dried hardwood pegboard c/w two chromed steel pegs and mounting hardware. Size 24" x 60", 20 holes.
 - .1 Standard of Acceptance: Laurentian Gymnastic Industries Model 301106.
 - .2 Acceptable Alternate Manufacturer: Gymnasium and Health Equipment, Madsen-Sheridan

8.2.9 ROPE TRACK

- .1 Two, six station rope track sets.
 - .1 Standard of Acceptance: Kodiak Industries 124-6; Centaur C146B
 - .2 Acceptable Alternate Manufacturer: Gymnasium and Health Equipment

8.2.10 CHINNING BAR-

- .1 Provide one chinning bar unit c/w adjustable bar and wall brackets. Finish: Bright chrome.
 - .1 Standard of Acceptance: Laurentian Gymnastic Industries 200901.

8.2.11 TELESCOPIC BLEACHERS

- .1 Provide three 20 foot sections of wall attached telescopic bleachers as indicated on drawings. Bleachers seat, decking and riser boards of clear laminated Douglas Fir.
- .2 Each section to have 7 rows spaced at 24". Rise: 12".
- .3 Bleachers to have the following accessories where indicated on drawings: 42" high folding end rails; 36" wide seat level aisles and front step; 96" x 15" scorer's table complete with steel sockets for legs mounted to bleacher, and end panels.
- .4 Acceptable Product: Wall attached telescopic bleachers by

8.3 MISCELLANEOUS SPECIALTIES

8.3.1 GENERAL

- .1 Submittals, etc:
 - .1 Package or crate, and brace products to prevent distortion in shipment and handling. Label packages and crates, and protect finish surfaces by sturdy wrappings.
 - .2 Deliver products to location at building site designated by Contractor.
 - .3 Provide reinforcing, fastenings and anchorage required for building in products.
 - .4 Insulation between dissimilar metals, and metal and concrete materials, to prevent electrolysis with bituminous paint to meet specified requirements of CGSB Specification 1-GP-159 if exposed to view.
 - .5 Products shall not have attached plates, nor shall they be imprinted or labelled with manufacturer's name or trademark unless approved.
 - .6 Specified materials are minimum acceptable quality. Manufacturer's standards exceeding specified quality will be accepted.
 - .7 All items to be CSA approved.
- .2 Outdoor basketball equipment
 - .1 Provide 10 new outdoor basketball backstops each including:
 - .1 Galvanized posts: Laurentian 400432
 - .2 Steel fan backboard 12 ga. Laurentian 400202
 - .3 Steel goal, heavy duty Hercules RM3
 - .4 Steel net, 12 loops Laurentian 400302
 - .2 Acceptable Alternate: Paris Playground or Gymnasium and Health
- .3 Bicycle rack
 - .1 Supply and install 1 Bicycle Rack: fence type; stationary; 1.66" OD x .095" wall tubing frame c/w 1/2" steel rod wheel supports. Polyester powder coat finish. Acceptable Product: Paris Playground 60709802(R3). Provide a capacity of two bikes per classroom.
- .4 Playground Equipment (Elementary Schools only)
 - .1 To meet CAN/CSA-Z614-M90.
 - .2 All steel to be polyester powder coated.
 - .3 Galvanized steel posts and steel platforms

- posts 5" o.d. coated with polyester powder coat
 - decks perforated steel decks, thermal plastic coated
- .4 Provide safety rails, safety panels.
- .5 Unit to have
- 6 steel platforms
 - 3 chinning bars
 - track ride
 - ring track
 - S rail overhead climber
 - wavy horizontal ladder
 - crunch bar
 - squiggly firepole
 - 2 rung firepole
 - deck ladder
 - climbing wall with chain
 - kick plate
- .6 Acceptable Manufacturers: Paris Playground Equipment Ltd.
- .7 Model: Recess Play System Model #90687000
- .5 Outdoor Seating
- .1 Wood bench supported on two steel "T" frames.
 - .2 Size: 72" long x 28" wide x 18" high.
 - .3 Acceptable Product: Paris Playground #7013370
 - .4 Quantity: 20
- .6 Tetherball Posts (Elementary, Junior High and Middle Schools only)
- .1 Paris Playground #60 711900
 - .2 Quantity: Three
- .7 Soccer/Football Goal Posts
- .1 Provide two combination soccer and football goal posts all steel construction galvanized after fabrication, set in concrete footings.
 - .1 Acceptable Products: Royal Stewart Model RS-27; Gym and Health Equipment Model GH-407.
- .8 Stage Curtain Track: Provide fireproof, electric drawn drapery track. Provide 1/2 H.P. electric draw curtain machine and 3/16" galvanized aircraft cable, c/w disconnect switch, overload protection breakers and motor thermal overload. Acceptable Material: Model #916, by Quality Stage Drapery. Alternate GC Stage Equipment.
- .9 Stage Curtain: Quantity as required to suit design. Provide flameproof, 20 oz. quality velour curtain c/w valence, to match curtain. Height of valence to be 36". Fullness of curtain and

- valence shall both be 80%. Colour as selected by Architect.
Acceptable Material: Camrose by Quality Stage. Alternate: GC
Stage Equipment/JB Martin Fabrics. Quantity to suit design.
- .10 Cyclorama Track and Curtain:
- .1 Provide Cyclorama track and curtain at stage as indicated on drawing.
 - .2 Track: I Beam track constructed of 11 gauge extruded mill finished aluminum, with top, intermediate and bottom flanges. Track complete with carriers @ 8" o.c., curtain hooks, and all necessary ceiling clamps. Acceptable Product: #403 Track by Quality Stage.
 - .3 Curtain: 16 oz. stage velvet, flame resistant backdrop curtain, 35% fullness. Curtain to be grommeted at 8" o.c. with brass grommets and be attached to the center of a trim chain on the track carrier with "S" hooks. Provide curtains in three pieces: one 35' long, two 25' long. Colour: Black. Acceptable Product: Provost backdrop curtain by Quality Textiles. Alternate: GC Stage Equipment, to match.
 - .4 Quantity: as required to suit design.
- .11 Portable Stage Steps:
- .1 Provide three sets portable stage steps, c/w removable handrail and floor socket type anchor bolts. Maple or birch construction. Quantity as required to suit design.
- .12 Flag Pole:
- .1 Flagpole material to be aluminum. Aluminum Association Alloy AA 6063-T5 seamless extruded aluminum tubing. Sateen finish.
 - .2 Complete unit to be 40' long flagpole including base mounting brackets, anchorage and fittings.
 - .3 Cone tapered flagpole, seamless, uniform, straight line tapered section above cylindrical butt section.
 - .4 Tapered 1" in 5'-6" of run.
 - .5 Provide internal splicing, scif-aligning sleeve of same material as flagpole for snug fitting, watertight field joints.
 - .6 Finial: 6" diameter ball of 3/16" minimum thick, aluminum, anodized, colour gold.
 - .7 Truck Assembly: stainless steel ball bearing, nonfouling, revolving double truck assembly, finish to match flagpole.
 - .8 Halyard: internal nylon, braided, with steel or bronze core. Retaining loop and weights for internal halyard, stainless.
 - .9 Swivel Snaps: two per halyard; aluminum with neoprene or vinyl covers.
 - .10 Cleat Box: one per cleat; cast aluminum finish to match

- flagpole. Furnish hasp for padlock, hinged cover, and tamper-proof screws. Include lockable cleat box. Finish: Clear anodized. Acceptable Manufacturers: All-Canadian Flag Pole Co. ACC-30; John Ewing & Co. Inc.
- .11 Rolling Fire Rated Shutter Door: Rolling rated steel shutter constructed of interlocking flat steel slats complete with U/L approved fuse link automatic closing device, end locks and slide bolts for locking. Push up type, jamb mounted, size as indicated on drawings. Finish: Stainless Steel. Acceptable Product: Kinnear - Atler Model FC17; Atlas L-11-ST. Quantity as required to suit design.
- .13 Laminator:
- .1 Hot roll laminator as manufactured by GBC Model #4250.
 - .2 32" wide x 21" long x 12" high.
 - .3 25" continuous roll laminating.
 - .4 Resilient rubber heat rollers.
 - .5 Safety retractable cutting blade.
 - .6 Reverse motor switch.
 - .7 Laminate thickness 1.5 mil; 3.0 mil; 5 mil.
- .14 Chair Dollies: Ven-Rez Products, new assembly complete with angle floor guide system and swivel ball bearing casters. Minimum quantity. 10x8'-0" long units and 10 x 6'-0" long units ganged together in pairs to form 10x14' long units, Model 13-778.
- .15 Fire Extinguishers:
- .1 All extinguishers to be 10 lb. ABC as manufactured by Canadian Fire Hose-Corp. Ltd.
 - .2 Acceptable Alternates: the Williams Brothers Corp. and National Fire Equipment.
 - .3 Quantity as required to suit design.
- .16 Exterior Signage:
- .1 Provide 12" high prefinished individual aluminum letters.
 - .2 Size and quantity as required to suit design and identify school.
- .17 Interior Signage:
- .1 Faces of colour acrylic sheet, surface engraved number and name plates.
 - .2 Mounted with stainless steel screws.
 - .3 Number plates shall be 3" high and of sufficient length to have 3 numbers each 2" high.
 - .4 Combination name and name plates to be 3" high and 20" long.
 - .5 Quantity as required.

- .6 Room numbers are to be consistent with architectural floor plan numbers.
- .7 Room name plates are required on all specialized rooms.
All signage is to be barrier free.
- .18 Identification Devices:
 - .1 Provide male or female pictograms for all washrooms/shower. Size, colour and style to be selected by Architect.
 - .2 International symbol of access (CAN 2 321) indicated barrier free accessibility for all washrooms.
- .19 Library Shelving and Equipment
 - .1 Library shelving to CGSB-44-GP7.
 - .2 All end gables to be 3/4" thick birch plywood veneer complete with solid birch edging 3/4" x 3/4".
 - .3 A portion of library shelving shall be all wood construction prevent magnetic interference with multi-media diskettes and video cassettes.
 - .4 Powder cost paint metal finish: beige.
 - .5 All shelves to be one piece slotted box shelf.
 - .6 Provide one divider per shelf.
 - .7 All units to be c/w kickplates and dust cover.
 - .8 Number and quantity as required to suit library layout.
- .20 Library Furniture
 - .1 One flat file storage cabinet - Ven Rez 5 drawer plan file 905-40261-71. C/W base colour beige. 909-04700-00.
- Acceptable Alternate: Lincora Planor
 - .2 One magazine display stand - c/w oak base 20 1/2 x 20 1/2 and spinner 18 1/2" dia. Brodart 85-244-003, 4 tier.
 - .3 One newspaper display stand - 20 pocket unit, two sided 60" h x 20" w x 17 1/4" d, Gayland NE-14.
- .21 Library Security System
 - .1 One required - purpose made for libraries.
 - .2 Complete with:
 - exit control unit
 - Detection computer
 - Detection strips (10 boxes of 1000)
 - .3 Acceptable Manufacturer: 3M
 - .4 Acceptable Product:
 - Model 955 Bookcheck Unit
 - Model 2300 Detection Computer
 - DS-1/DS-2 Dual status detection strips - 10 boxes of 1000
- .22 Wall Hung Presentation Cabinets:
 - .1 Wood crafted cabinet unit, size: 3' x 6" h x 4'-0" w,

- .2 opening to 3'-6" x 8'-0" vinyl wood grain finish - Oak.
.2 Unit complete with magnetic porcelain whiteboard; cork lined doors; flip chart pad; eraser and magnet; pins; 12 dry wiper pens - 4 colours.
.3 Acceptable Product: Boardroom wood crafted unit as manufactured by Architectural School Products Ltd. or Delta Model 93.
.4 Quantity - Two.
- .23 Lockers:
.1 Size 12" x 15" x 72", and 12" x 15" x 60".
.2 Top: Sloping
.3 72" high single tier lockers in corridors, 60" high single tier lockers on bench in change rooms.
.4 Accessories: Hat shelf, 2 coat hooks.
.5 Latch: for Owner's padlock.
.6 Number Plates: As directed.
.7 Colours: As indicated on colour schedule.
.8 All lockers to be factory assembled.
.9 Doors: Double pan design, 16 ga. outer panel and 24 ga. steel inner panel, complete with reinforcing z bars per door.
.10 Frame: 16 ga. steel.
.11 Sides and back - 24 ga. steel.
.12 Top: 20 ga. steel.
.13 Manufacturer: GSW; Shanahan; Lincora; List.
.14 Quantities: Corridor one per student (except Elementary students); Change Rooms 43 in each change room.
- .24 Sound Doors:
.1 To be insulated hollow metal with STC rating of 51 c/w 14 ga. pressed steel frame, perimeter sound seal, sound seal astragal and mortised bottom seals, size as indicated on drawings.
.1 Acceptable Product: Sound Stopper by Ambico Limited.
.2 Quantity: All music room doors
- .25 Flammable Storage Cabinet: One required in each science lab.
.1 Cabinet to have double walls of 18 ga. steel with 1 1/2" air space and welded joints.
.2 Self closing door with fusible link to assure automatic closing of door in case of fire in cabinet.
.3 Large red lettering on door reading: flammable - keep fire away.
.4 Capacity: 120 litre capacity with one 14" deep adjustable shelf. Overall size 18" x 43" x 44".

- .5 Acceptable Product: Fisher Scientific Model 14-204.
- .26 Fume Hood (for High Schools)
- .1 Standard air fume hood.
 - .2 Integral light complete with switch.
 - .3 Full view laminated safety glass.
 - .4 Complete with base cabinetry, sink, and prewired electrical outlet.
 - .5 Stainless steel surface.
 - .6 Stainless steel liner panels.
 - .7 Standard of Acceptance: NORLAB 47 SA (47" wide) 100 FPM average face velocity. Note: Ventilation to exterior required by Mechanical.
- .27 Chemical Storage Cabinet
- .1 Double wall construction, 1-1/2" air insulated cabinet.
 - .2 Bottom and shelves to be corrosive-resistant polyethylene trays to contain spills.
 - .3 Size 44" x 43" x 18" complete with 2 shelves and 3 trays.
 - .4 Standard of Acceptance: NORLAB, Model SA082.
- .28 Roof Hatch: galvanized steel roof hatch complete with curb and integral flashing. Size 2'-6" x 3'-0".
- .1 Acceptable Products: Bilco Type S as manufactured by Richard Wilcox of Canada Ltd., Lexuco #A-30.
- .29 Projection Screens: front projection screens, 72" high x 84" wide, wall mounting type. Viewing surface to be fibreglass matt white flame and mildew resistant complete with Fabrick-Lok Spline/Groove design. Screen to be enclosed in steel case, flat back design with vinyl walnut woodgrain finish complete with end caps.
- .30 Sewing Machines: (All schools except Elementary)
- .1 For school use c/w built-in buttonholer, drop in bobbins, and free arm.
 - .2 CSA approved.
 - .3 Singer stylist model #9210 c/w protective case to include the following features:
 - .1 Sews sixteen (16) stitches.
 - .2 Automatic tension system.
 - .3 Six (6) second threading.
 - .4 Horizontal thread delivery.
 - .5 Built in buttonholer.
 - .6 Touch and wind handwheel declutching.
 - .7 Fully enclosed motor.
 - .8 Electronic speed control.
 - .9 Handy free arm.
 - .10 Front drop in bobbin.

- .11 Snap on pressure feet.
- .12 Instant or sustained reverse.
- .13 Slant needle.
- .14 Self lubricating.
- .15 Durable body.
- .16 Built in handle - large.
- .17 Extra wide zigzag stitch (1/4").
- .18 Complete accessory kit and detached manual.
- .4 Cabinets and Benches: (5 only)
 - .1 Special purpose for use with the above machines, Table #406 in white and chair #443990 without castors.
- .5 Quantity: 15
- .31 Sergers: (All schools except Elementary)
 - .1 Industrial strength
 - .2 Differential feed 4 thread
 - .3 Stationary cutter
 - .4 2 thread inside change
 - .5 Front opening visible
 - .6 Tension release button
 - .7 Acceptable Product: White Model 2000 ATS; Singer Quantumlook 4
 - .8 Quantity 4
- .32 Computerized Sewing Machine (all schools except Elementary)
 - .1 Acceptable Product: Husquavarna # 1 Plus
 - .2 Accessories: feet cards, cassettes
 - .3 Provide Husquavarna airlift cabinet
 - .4 Provide Husquavarna swivel chair
 - .5 Provide full software package for complete operation including 30 embroidery cords per sewing machine.
- .33 Fire Blankets:
 - .1 Fire retardant 100% wool blanket in wall mounted metal case.
 - .2 Blanket size: 60" x 80".
 - .3 Acceptable Product: Fisher Scientific Model 10-004; Northwest 17-5153A or National Fire Equipment.
- .34 Vertical Blinds:
 - .1 Supply and install #2400 vertical blind system as manufactured by Silent Gliss Canada Limited to all windows and all borrowed lites.
 - .2 The system shall have one single cord to control both the rotation and the traversing of the vanes.
 - .3 The header shall be made of 8063-T6 aluminum, white

baked enamel colour, measuring 25 mm (1") high and 44 mm (1 3/4") in width. the vanes shall be fastened to the rail by means of vane holder #2477, leaving not more than 14 mm (5/8") of space between headrail and top of vanes.

- .4 The system shall come complete with all necessary components, including rotation elements #2445/46 (for 3.5" vanes) or #2441-42 (for 5" vanes), spaced evenly at 76 mm (3.5") o.c.
- .5 The headrail shall be ceiling mounted with #2419 metal ceiling brackets spaced approx. 800-1000 mm (30-40") apart (or wall mounted using #2419 brackets with same spacing).
- .6 Entire rail system shall be guaranteed for 5 years as per warranty terms of Silent Gliss Canada Limited.

.35 Table Saw (all schools except Elementary)

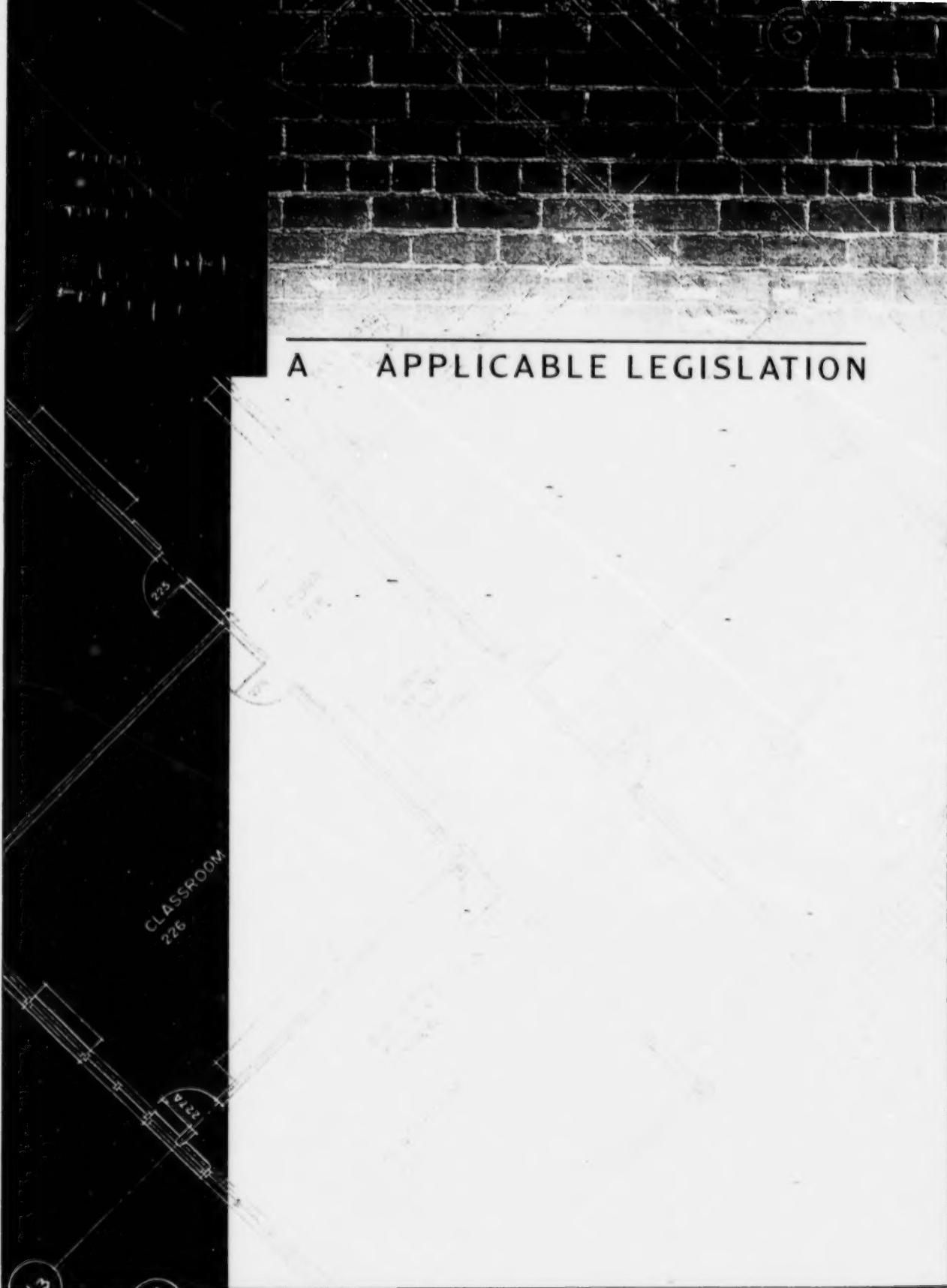
- .1 10" tilting Arbor saw - 28" x 36" complete with:
- .2 Manufacturer: General
- .3 Model: #350-1
- .4 Accessories:
 - 1 sawdust extraction fitting
 - 1 standard table insert #350-2
 - 1 dado and moulding cutter insert #350-3
 - 1 blank insert #350-4
 - 1 miter gauge #350-5
 - 1 extension table #50
 - Biesemeyer Fence #F42-T50
 - 1 set steel legs
 - 1 stop rods #1950-1
 - 1 motor cover #350-6
 - 1 splitter mounted guard 350-7
 - 1 overarm safety guard #350-9
 - 1 combination saw blade #3544
 - 1 rip saw blade #3545
 - 1 cross cut saw blade #3546
 - 1 hollow ground planer saw #3547
 - 1 carbide tipped combination saw 8 teeth #3548
 - 1 dado head set 6" dia. x 13.16" # 3549
- .5 Motor: hp totally enclosed single phase, 208 V. 3450 rpm c/w magnetic starter and mounting bracket.
- .36 Wood Turning Lathe - two required (all schools except elementary)
 - .1 12" variable speed wood lathe
 - .2 Manufacturer: General.
 - .3 Model # 260-1-M3.

- .4 Accessories required:
- 2 three jaw chucks #2652
- 2 screw on arbors #2649
- 2 screw centres #1648
- 2 left hand thread face plates #2538-1
- 2 twelve inch face plates #2647
- 4 tool rests #1624T
- 4 tool rest bases (extended) #264T
- 2 gap filler blocks #2645
- 2 sets wood turning chisels #2650
- 4 ball bearing centres #2651T
- 1 safety shield #2655T
- 1 sawdust extraction fitting
- .37 Drill Press - one required (all schools except Elementary)
.1 Floor model drill press
- table 10" x 11"
- key chuck 0" to 1/2"
.2 6 Speed ;motor - 1/2 hp/1725 rpm to provide six spindle speeds.
.3 Power: single phase, 208V.
.4 Provide motor controls as required.
.5 Manufacturer: General.
.6 Model: 34-01-M3.
.7 Accessories:
- mortising attachment #34-04
- collar #34-05
- raising mechanism #24-18
- foot feed # 34-06
- sawdust extraction fitting
- .38 Radial Arm Saw - One required (all schools except elementary)
.1 12" radial arm saw, table size 25 1/2" x 30"
.2 Motor: Single phase, 2 HP/208V/3450 RPM
- 24V at on-off key switch, magnetic starter
.3 Manufacturer: Delta
.4 Model # 33-891
.5 Acceptable Alternate: Rockwell
.6 Accessories: sawdust extraction fitting
- .39 Bandsaw: Two required (all schools except Elementary)
.1 Two 15" wood cutting band saw complete with:
- 15 x 15" tilting table
- heavy gauge steel base
- concealed pulley and belt
- 1/4" saw blade

- motor pulley
 - V-belt
 - Instruction manual
- .2 Single phase, 208V, 1/2 hp, 1725 rpm
- .3 Manufacturer: General.
- .4 Model #4900
- .5 Accessories:
 - 2 sawdust extraction fittings
 - 2 enclosed steel bases #4900
 - 2 rips fence with guide bars #4949
 - 2 miter gauges # 1950
 - 2 lamp attachments #1951
 - 2 lamp bulbs 25 watts
 - 2 set stop rods 1950-1
- .40 Jointer: One required. (all schools except Elementary)
- .1 One jointer with set of 3 knives, 2 way tilting fence, safety cutter head guard, arbor pulley, motor pulley, v-belt, enclosed steel base, instruction manual.
 - .2 Motor: Provide 1 1/2 hp motor and magnetic starter, single phase, 208V.
 - .3 Manufacturer: General.
 - .4 Model # 480-1-M3.
 - .5 Accessories:
 - 1 sawdust extraction fitting
 - 1 set of three 8" HS steel knives #480-3
 - 1 set of three throw away knives #480-4
 - 1 set of chip breakers for 480-4 #480-5
 - 1 magnetic knife setting gauge #JJ-2
 - grinding attachment #7810
- .41 Scroll Saw: One required (all schools except elementary)
- .1 One 20" variable speed scroll saw.
 - .2 Motor: 1.25 amp, 115V, single phase
 - .3 Manufacturer: Delta.
 - .4 Model 40-640C-20".
 - .5 Accessories:
 - Universal stand #50-330C
 - sawdust extraction fitting
- .42 Thickness Planer: One required. (All schools except Elementary)
- .1 One 14" single surface planer c/w stand and instruction manual.
 - .2 Motor: 5 HP, single phase, 208V.
 - .3 Manufacturer: General.
 - .4 Model #130-1-M3.

- .5 Accessories:
- 1 sawdust extraction fitting
- 1 set of 3 knives #1302
- 1 shaving hood #1304
- .43 Spindle Shaper: One required. (all schools except Elementary)
.1 One spindle shaper c/w pulleys, belts, self-adjusting tools, integral base, instruction manual.
.2 Motor: 5 HP, single phase, 208V.
.3 Manufacturer: General.
.4 Model No. SS-032.
.5 Accessories:
- 1 sawdust extraction fitting
- 1 safety cap #3071-A
- 1 groove cutters collar assembly #3069-A
- 1 depth guide collar #3070-A
- 1 collar assembly w/bearings #3067
- 1 spacer top and bottom #3068-3069
- .44 Computer Lathe:
.1 One required (all schools except elementary)
.2 Manufacturer: Shopware Machine Inc.
.3 Model:
- CNC Training Lathe for wood turning complete with all software for complete operation
- SNS 110 for MacIntosh
- M9893K - 10 TF 5028
.4 Accessories Required:
- 1 set lesson plans
- 2 lesson books
- 1 set video tapes
- .45 Workbench for computer lathe: (all schools except Elementary)
.1 14 ga. black enamel steel base.
.2 6" x 3" steel legs
.3 Hardwood top
.4 Bottom shelf - plywood
.5 Size: 72" x 30" x 32" high
.6 Acceptable Manufacturer: Ven Rez
.7 Model # 60-7230-32

A APPLICABLE LEGISLATION



Appendix - Applicable Legislation

Schools will be designed and constructed to meet or exceed the following, with the provision that wherever the requirements of this School Planning Manual exceed the following minimum standards, the Manual shall become the minimum acceptable standard.

- Nova Scotia Building Code Regulations - 1996 Edition
- National Building Code of Canada - 1995 Edition
- Barrier Free Design - CANS/CSA-B651-95
- National Fire Code of Canada - 1995 Edition
- National Fire Protection Association 13-1996 Edition
- Safety Code for Elevators - CAN/CSA-B44-94
- Vapour Removal from Cooking Equipment - 1991 Edition
- IESNA/ANSA, RP-3-96, Educational Facilities Lighting
- CAN/CSA-Z614-90 for Playgrounds
- CAN/ULC-S524-M91 Standard for the Installation of Fire Alarm Systems
- CAN/CSA-T529-M91, Design Guidelines for Telecommunications/Wiring Systems in Commercial Buildings
- CAN/CSA-T530-M90, Building Facilities, Design Guidelines for Telecommunications
- IEEE Standard 241-1990 Electrical Power Systems in Commercial Buildings
- CAN/CSA-C282-M89, Emergency Electrical Power Supply for Buildings
- Nova Scotia Special Places Protection Act - an act to provide for the preservation, regulation and study of Archaeological and Historical Remains and Palaeontological and Ecological sites.
- Nova Scotia Association of Architects Act
- Association of Professional Engineers of Nova Scotia Act
- Nova Scotia Occupational Health and Safety Act
- Nova Scotia Fire Prevention Act - an act to amend and consolidate the Acts relating to Fires and Fire Escapes.
- Nova Scotia Ditches and Water Courses Act
- Nova Scotia Water Act - an act to preserve and protect the Beaches of Nova Scotia.
- Ozone Layer Protection Act - An Act to protect the Ozone Layer from further damage.
- Erosion and Sedimentation Control Handbook for Construction Sites - Nova Scotia Department of Environment
- Nova Scotia Department of Transportation Standards Specification Road Construction
- Halifax Regional Municipality Standard Drawings - Engineering and Works Department
- Asbestos Control in Buildings - Pinchin and Associates
- Standard Specification for Municipal Services - NSRBA and NSCEA
- CSA approval on all equipment
- Canadian Electrical Code, 1998

plus other standards to be found elsewhere in this Manual.